DOCUMENT RESUME

ED 132 441 CE 009 375

TITLE Industrial Arts Performance Objectives, 1976. Four Clusters: Construction Technology, Graphic Communication Technology, Manufacturing Technology, Power and Energy Technology.
SPONS AGENCY Michigan Industrial Education Society, Inc.; Michigan State Dept. of Education, Lansing.
PUB DATE 76
NOTE 210p.

EDRS PRICE MF-$0.83 HC-$11.37 Plus Postage.
DESCRIPTORS *Behavioral Objectives; Construction (Process); Graphic Arts; *Industrial Education; Manufacturing; Power Mechanics; Secondary Education; Skill Development; Technical Education; *Training Objectives; Vocational Education

ABSTRACT

This compilation of objectives was prepared by 35 industrial education teachers in the state of Michigan. It is indicated that these performance objectives should not be viewed as complete course objectives but rather as a listing of objectives which can be used where appropriate. After an introductory section, providing a general outline of a school safety program for the industrial arts school shop or laboratory, objectives are presented for 10 subareas grouped in four clusters: (1) Construction Technology (Residential Architectural, Wood Technology); (2) Graphic Communication Technology (Graphic Arts, Design and Sketching, Mechanical Drawing); (3) Manufacturing Technology (Metal Technology, Plastic Technology); and (4) Power and Energy Technology (Electricity-Electronics, Small Engines). A listing of required tools and equipment is provided for each performance objective. The appendixes contain the lists of writers, reviewers, and the editing group; the Michigan Safety Standards List; and a safety inspection checklist. (NL)

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Industrial Arts
Performance Objectives

Project Coordinators
Emmett Mason
Gerald Briggs

1976

This project was jointly funded by the Michigan Industrial Education Society, Inc. and the Vocational-Technical Service of the Michigan Department of Education (Project # 3255-7171).

PREFACE

The objectives presented here are a compilation of objectives prepared by thirty-five industrial education teachers in the state of Michigan. They were reviewed and edited by other teachers for clarity and format. In some cases they fall short of being performance objectives but since performance criteria and tools and equipment vary between schools it is hoped that the performance or task portion will still be useful.

These objectives should not be viewed as complete course objectives but rather a listing of objectives which can be used where appropriate.

Critics of this effort will find a conceptual base lacking but these objectives reflect what teachers say they are teaching. Teachers who participated as writers will recognize that all of their objectives are not present. This is because the reviewing group believed for several reasons (duplication, too vocational, too project related, etc.) that they should be omitted. Reviewers will find that some of their suggestions were ignored. This was in part because they were coming from different directions or simply because the editing group could not incorporate all the suggestions.

The project coordinators hope that this listing of objectives is useful to those teaching first or second year general industrial education (industrial arts) course regardless of whether they are junior or senior high school level.

Thanks are extended to the Michigan Industrial Education Society, Inc. and the Vocational Technical Education Service of the Michigan Department of Education for project funding. Even greater thanks are extended to those who wrote, reviewed, and edited for this project.

Emmett Mason, MIES
Gerald Briggs, VTES
Project Coordinators

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The teacher in the Industrial Arts or Vocational Education school shop is the organizer and director of learning experiences and activities for those pupils under supervision. This is a responsibility the teacher assumes when accepting this position.

The professional teacher accepts this responsibility by carefully selecting curricular materials and experiences, organizing and presenting them in such a manner so as to bring about desired behavior outcomes and attitudes in the students.

While this section on safety is designed to serve the teacher as an aid in presenting fundamental safety rules and practices, it is not an entire safety program. The construction of a safety program to be incorporated throughout the course of study is the ultimate objective that this information would hope to stimulate.

It is thus hoped this will serve as the key or prime source of reference to which to turn for inspiration and ideas for class discussion. The teacher is encouraged to duplicate any material in this section for classroom use.

It is not the purpose here to tell the teacher how to teach safety. While the specific standards must be reviewed*, the value of rote memorization might be questioned. The significant aspect is the safety awareness and attitude which must be developed in the student through continued daily efforts of an organized program. The reasoning and logic behind each rule must be explained, if it is to be remembered.

The temptation to "read through" the entire list of safety practices at the beginning of the school year without further discussion is to be avoided. While several general safety precautions must be presented early in order to have the shop function safely, consideration should be given to the sound, educational principal of giving instruction when it will be most timely and meaningful to the student.

Any discussion of the safety rules should be related to conditions and equipment found in that particular shop. This should be done not only prior to an activity, but also when a rule is violated or an accident has occurred.

A safety program has much greater change of success when the students participate and become actively involved in planning and presenting programs, demonstrations, etc. Safety instruction is not incidental nor accidental. It must be taught in an organized manner and as a never ending subject.

Lastly, the psychological or human value element cannot be ignored in safety instruction. Most teachers go to great lengths to protect physical equipment in terms of dollar loss in case of damage. While this has importance in industrial education, emphasis must be placed on the tragedy of injuries and accidents, which in some cases, causes irreparable loss to the individual and the community.

*See Appendix B
Copies of these rules may be obtained by sending the enclosed order form to the Department of Labor in Lansing. It is suggested you only order the sections that apply to your teaching area.

SAFETY

Prevention

The teacher shall assume a matured position of responsibility in providing for the personal safety of each student in the classroom or laboratory.

In compliance with this policy the teacher shall provide a continuous safety program as related to the respective subject area and shall take the following reasonable and prudent actions.

-Reports knowledge of hazardous conditions relating to the shop, the machinery and equipment, to the proper school authorities.

-Regularly inspects machinery, equipment, and environmental factors for safety.

-Posts conspicuous notices of regulations, possible hazards, safeguards, and precautions.

-Makes certain that appropriate safety devices and guards are available and used by students.

-Makes sure students know and understand pertinent safe practices relating to the activities in which they are engaged.

-Requires students to wear appropriate personal protective equipment, such as safety glasses, goggles, face shields, etc. so as to be in compliance with Act 54 of the Public Acts of 1972.

-Adequately instructs and demonstrates the use of power tools or other hazardous equipment before initially permitting such use by a pupil; permits initial use only under direct supervision of the teacher.

-Shuts off power tools and locks main switch if he/she must leave the shop.

-Exercises continuous supervision to see that shop safety practices are observed.

-Makes himself a model for pupils to follow by personally obeying all safety rules and practices.

Accident Factors

There are five basic factors which may act singly or in combinations thereof in causing accidents. In brief, they can be identified as follows:

Teacher: Improper job supervision or instruction and overall plant management.

Student: Committing unsafe acts endangering self and/or others.

Facility: Poor health conditions affecting sight, hearing, temperature, respiration and overall poorly maintained and arranged.

Equipment: Unsafe for use: defective parts, lacking proper guards and adjustment.

Materials: Too small or too large for specific machine/tool, or working materials with wrong tools.

Of the factors listed, statistics have indicated that three out of every four accidents have been caused by personnel committing unsafe acts. According to the National Safety Council, an unsafe act can be defined as "A violation of a commonly accepted safe procedure."

The School Safety Program

School shops and laboratories provide an environment for the development of safety concepts and safe habits that will help guide the actions of tne individual in all life situations. Some of the benefits derived from a "sound safety program" are immediate, and some are long range. Before embarking on a safety program for students, the teacher must first check to see that the physical plant and equipment is satisfactory to be conducive to an effective safety program. The following is a sample program.

Safety Practices for Teachers

Safety Inspections

1. Conduct periodic safety inspections.
2. Use shop safety inspection checklist. *See Appendix A

Accident Reports

1. Make a report of all shop accidents resulting in injuries to students to the school administration, regardless of nature or severity.

2. Keep a permanent record of all shop accidents resulting in injuries to students.

Instructional Techniques

1. Develop safe work habits in students through teacher example.

2. Teach accident prevention with a positive approach.

3. Provide conspicuous visual aids.

4. Update information and techniques.

Equipment Safety

1. No combination machine shall be used in shop.

2. All belts and rotating gears shall be adequately guarded or barricaded.

3. Permit students to use a machine only after passing an examination on the safe operation of the machine. No age stipulation will be imposed on a student. The student's maturity and ability to operate the machine will be the instructor's guidelines.

4. Prohibit students from operating any machine when the instructor is not present. Disconnect and lock main power switch when leaving for any period of time.

5. Fasten all machines securely to the floor or workbenches.

6. Accept personal responsibility for all students using machine or hand tools in the shop.

7. Use standardized color coding on all hazardous machines to emphasize danger areas.

Housekeeping Practices

1. Provide for daily removal of all sawdust, shavings, metal cuttings, and other waste materials.

2. Provide safety zones in maintaining required aisle space and working space around machines.

Housekeeping Practices (Con't)

3. Provide for cleanup of the shop equipment and floors at the end of each period depending upon the rate of scrap accumulation or as required.

Electrical Safety

1. Make all equipment switches easily accessible to the operator.

2. Provide a ground on all motors, switch boxes, and other electrical equipment.

3. Teach students that all electrical apparatus is "hot" and must be utilized with precaution.

Fire Safety

1. See that fire extinguishers are provided in the shop area and that they are regularly inspected and tested.

2. Store flammable liquids in approved safety containers, and that these materials shall in no case be used near an open flame.

3. Provide metal-covered container for grease and paint rags.

4. Provide instruction and practice in the proper procedure for evacuating the shop in case of fire or other emergencies.

5. All students shall be familiar with fire exits and exit procedures.

First Aid Practices

1. Provide a first aid kit in the shop easily accessible to all, and properly maintained and marked.

2. Provide only emergency first aid treatment for serious injuries and then refer to qualified medical personnel for treatment. Do not prescribe or administer any medication.

3. Enroll in and successfully complete American Red Cross first aid course.

Personal Protection

1. Prohibit running in shop at any time.

2. Prohibit horseplay or practical jokes of any kind within the shop area.

3. Required wearing of proper eye protection when there is a danger of flying particles or chips.

4. Provide proper respirators for student use when harmful dusts or fumes exist.

5. Require students to observe rules in regard to proper clothing and protective devices when operating hazardous equipment.

6. Prohibit students from wearing rings and other jewelry when operating hazardous equipment. Long hairstyles shall be properly secured.

7. Require students to wear shoes at all times in the shop.

General Practices

1. Provide for cross-ventilation of air in the shop.

2. Take precautions to keep any source of poisonous or combustible fumes outside the shop.

3. Carry liability insurance as a protection against possible negligence charges.

4. Encourage all students to carry accident insurance.

5. Require students to sign an acknowledgement of safety instruction or examination taken.

6. Pledge cards are helpful in securing moral obligation from students.

7. Consistently enforce all rules and regulations in the shop. Fairness and trust have much value in any safety program.

Student Responsibility

As a student in Industrial Education you have a responsibility not only to yourself but to the group for safety within the classroom and the shop areas. Teamwork is required for the safety of all members who participate. Don't wait for the next person to correct an unsafe condition...just DO IT or call it to the attention of your teacher. The following outline is YOUR responsibility to your team:

1. FOLLOW INSTRUCTIONS:

   -observe safety rules.
   -no horseplay.
   -operate machinery only when authorized to do so.
   -keep machine guards in place.
   -follow approved procedures.

2. KEEP WORK AREAS CLEAR:

   -keep floors and benches clean.
   -replace tools properly.
   -wipe up spills.
   -aisles clear.

3. DRESS PROPERLY:

   -no loose clothing.
   -no jewelry.
   -secure long hair.
   -wear shoes.
   -use proper protective gear.

4. REPORT UNSAFE CONDITIONS:

   -missing guards.
   -defective machinery or tools.
   -frayed electrical cords or defective switches.
   -dull tools or machinery.
   -stop unsafe act by fellow student.

Safety Practices For All Areas

Safety rules vary from one school system to another. However, most school shops have definite rules and regulations to follow and the teacher has the responsibility to enforce them. A successful safety program results from an understanding by the students of the reasons and the advantages for each rule.

General Safety Rules

1. Have teacher approve all work that you plan to do.

   1. Assure the best, easiest, and safest way to do the job successfully.

   2. Protect all class members from accidents caused by careless or incompetent use of tools and machines.

General Safety Rules (Con't)

2. Report all injuries, even though slight, to the teacher immediately.

    1. Teacher will determine if treatment is required for the injury. Immediate attention may be given by the teacher.

    2. First aid treatment helps prevent minor cuts, abrasions, bruises, or burns from becoming infected.

    3. Assist teacher in correcting situations to prevent further injuries.

3. Observe rules concerning operator's safety zones.

    1. Prevent crowding and bumping the operator.

    2. Give student operator complete responsibility in the use of the machine.

    3. Protect all class members from injuries caused by moving machine parts and flying pieces of material.

4. Cooperate with your classmates in the student management of shop.

    1. Make sharing in the responsibilities of shop management a satisying experience.

    2. A greater amount of time for productive shop work will result from efficient handling of tools and materials.

    3. Equal distribution of tasks is necessary in maintaining a desirable place to work.

5. Obtain permission from instructor before using any power machine.

    1. Make sure that the machine selected will provide the best, easiest and safest method for doing the job.

    2. Allow instructor opportunity to check the condition of the machine.

    3. Provide instructor opportunity to make certain that all class members are protected from accidents caused by careless or improper use of equipment.

Safety Rules For All Students

General

1. Ask your teacher to approve all work you plan to do.

2. Report all injuries to your teacher immediately.

3. Wear suitable eye protection when engaged in any activity where eye hazards may exist.

4. Wear appropriate clothing for shop work. Remove or fasten any loose clothing or necktie. Roll sleeves above elbows.

5. Long hair should be confined to prevent becoming entangled in any moving part of a machine.

6. Wear shoes in the shop at all times to prevent foot injuries.

7. Observe rules concerning operators' safety zones.

8. Cooperate with your classmates in the management of your shop.

Safety Rules for All Students (Con't)

9. Caution any student you see violating any safety rule.
10. Horseplaying, running, and the throwing of objects in the shop are forbidden.
11. Report to the teacher any equipment or tool that does not seem to work properly. Do not force tools under any condition.
12. Keep tools and materials from projecting over the edge of benches whenever possible.
13. Use a brush or a piece of wood to clear away dry chips.
14. Keep floor clear of scraps and litter.
15. Wipe up immediately any liquids spilled on floor. Use a rag to clean oily areas.
16. Keep bench and cabinet drawers and locker doors closed.
17. Place oily rags and other combustible materials in a covered metal container.
18. Exercise care in handling large, heavy, or long material. Know proper method to lift any object.
19. Practice procedure to follow in case of a fire or other disasters.
20. Be sure hands and floor area are completely dry before handling any electrical equipment or receptacles.

Hand Tools

1. Do not use tools with oily, greasy, or wet hands.
2. Select the proper size and type of hand tools for the particular job.
3. Keep all cutting blades sharp and in good condition and provide safe storage for them when not in use.
4. Handle edged or pointed tools with care. Pass tools to classmates with the handles first.
5. When using sharp-edged tool, point edge away from yourself and your classmates.
6. Clamp small work on bench or secure in vise when using gouge, wood chisel, or screwdriver.
7. Control chisels, gouges, or carving tools with one hand while the other hand supplies the power.
8. Wear face shield or safety glasses when chipping or cutting with a cold chisel. Arrange your work so that classmates are protected from flying chips.

Machine Tools

1. Do not operate any machine tool with oily, greasy or wet hands.
2. Qualify as a safe machine operator.
3. Operate only those machines for which you have received instruction and permission to operate.
4. Check adjustments on machines before turning on the power. Rotate machine one revolution by hand whenever possible without danger.

Machine Tools (Con't)

5. Keep all safety guards in place.

6. Make sure all other students are outside the operator's safety zone before turning on the power. Safety zone shall be dry and clean.

7. Start your own machine and remain with it until it comes to a complete stop.

8. Notify teacher, or safety foreman when a machine is not working properly.

9. Stay clear of machines being operated by others. Do not lean on machines.

10. Wait for machine to come to a complete stop before oiling or cleaning. Turn off power switch and remove plug from outlet before making major adjustments or changes on machines.

RESIDENTIAL ARCHITECTURAL TECHNOLOGY

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Structural Details	
Draw structural wall section details for the following footings and foundations: a. Garage b. House w/o a basement or crawlspace c. House w/a basement d. Pier detail/meet local codes and Michigan Construction Codes with 75% accuracy.	drawing paper, straight edge, triangles, pencil or lead holder, templates, eraser, erasing shield, compass, dividers, brush, scale tape, lead pointer, lettering guide
Draw structural floor details for the following: a. Sill (western or platform) b. Side detail of the steel girder c. Front view of steel beam or girder d. Wood girder detail e. Sunken living room/meet local codes and Michigan Construction Codes with 75% accuracy.	same
Draw structural wall section details for the following exterior walls: a. Corner formed with three full studs b. Corner formed with three full studs with blocking c. Corner formed with three full studs with 1/2 shim d. Partition intersecting at stud e. Partition intersecting between studs f. Window and door openings/meet local codes and/or Michigan Construction Codes with 75% accuracy.	same

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Structural Details (continued)	
Draw structural wall section details for the following interior walls: a. Wall b. Archway or openings c. Door opening/meet local codes and Michigan Construction Codes with 75% accuracy.	same
Draw structural details for the following bearing wall sections: a. Diagonal b. Corner c. Top plate/meet local codes and/or Michigan Construction Codes with 75% accuracy.	same
Draw structural details for the following cornice framing: a. Flat or low pitched roof b. Open cornice c. Narrow box cornice d. Wide box cornice w/lookouts e. Wide box cornice w/o lookouts f. Typical close cornice/meet local codes and/or Michigan Construction Codes with 75% accuracy.	same
Identify 10 of the 12 following roof designs or types: a. Gable g. Winged gable b. Hip h. Dutch hip c. Flat i. Mansard d. Shed j. A-frame e. Butterfly k. Folded plate f. Gambrel l. Curved panel	sample visual examples, i.e., slides, photographs, visual test, or field trips

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Structural Details (continued)	
Identify 8 of the 10 following structural members used in roof framing: a. Top plate b. Hip rafter c. Ridge board d. Cripple jack rafter e. Valley jack rafter f. Gable ends g. Hip jack rafter h. Common rafter i. Overhang j. Valley rafter	same
Identify the following terms used in roof frame construction: a. Pitch b. Rise c. Run d. Span e. Tail cut f. Plumb cut g. Seat cut h. Plumb cut at ridge board/100%	same
Determine and select the girder size required/ 75% accuracy.	samples of area of coverage and load weights, references
Determine and select the joist size required/ the selection will be 75% accurate.	sample span and load weights, references
Determine and select the column size required/ 75% accuracy.	samples of height, load weight and references
Identify 8 of 10 terms common to window and door details: a. Jamb b. Header c. Sill d. Rought opening e. Sash size f. Schedule g. Window and door types h. Hollow doors i. Fire rating	sample visual examples

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Structural Details (continued)	
Identify 8 of 10 terms common to stairway details: a. Headroom f. Unit run b. Stringer g. Threads c. Total rise h. Riser d. Total run i. Landings e. Unit rise j. Nosing	same
Identify 8 of 10 terms common to fireplaces: a. Cap f. Fire brick b. Damper g. Face brick c. Smoke shelf h. Hearth d. Lintel i. Ash pit e. Flue lining j. Mantel	same
Planning	
Identify several architectural styles such as: Cape Cod, Cape Ann, Cape Colonial, Garrison, Saltbox, Southern Colonial, Spanish, New England, Dutch Colonial, Modern structures, and Ranch/recognize those characteristics common to eight of the eleven styles.	sample visual examples, i.e., slides, photographs or visual test field trips
Identify six basic house designs such as: one story ranch, one and one half story, two story, split level, tri-level and bi-level/accuracy of 8 out of 11.	visual examples of the different house designs
Identify elements of good design such as: form, space, light and shadow, texture, line, and color/ with 8 out of 11 visual examples.	sample visual examples, i.e., slides, photographs or visual test field trips

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Planning (continued)	
Identify the principles of good design such as: unity, repetition, rhythm, variety, emphasis, and balance/with 8 out of 11 visual examples.	same
Identify the two basic architectural design procedures such as: planning with room templates and floor plan sketching/with 100% accuracy.	same
Sketch a finished floor plan by use of one of the two basic design procedures/layout will meet local codes and/or AIA standards with 75% accuracy.	sketch paper and pencil, 9 x 12 tag board for templates
Apply the accepted drafting practices/as described in the AIA Office Practice Manual.	AIA Office Practice Manual or local architectural standards
Working Drawings	
Draw a basement plan containing: a. Exterior and/or interior structural walls b. Girder with size c. Column footing with size d. All members labeled e. Joist direction with size f. All necessary measurements g. Any door, window, and stair openings/ all drafting practices according to AIA Office Practice Manual.	basic drafting equipment
Draw a first floor plan containing: a. All rooms labeled b. Basic dimensions (overall and location) c. All appliances labeled	same

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Working Drawings (continued)	
d. Bathroom fixtures labeled e. Center to center dimensions for windows and doors f. Window and door schedule g. All exterior and interior walls drawn h. Openings for all windows and doors/all drafting practices according to AIA Office Practice Manual.	same
Draw the four (4) exterior elevations, with all basic dimensions and symbols/all drafting practices according to AIA Office Practice Manual.	same
Draw the four (4) interior kitchen elevations, with proper material symbols/all drafting practices according to AIA Office Practice Manual.	same
Draw the front elevation of the fireplace, with all necessary measurements and material symbols/all drafting practices according to AIA Office Practice Manual.	same
Draw all necessary structural details such as: vertical wall section, any foundation or cornice detail necessary for the workman to construct that building with necessary measurement and symbols/all drafting practices according to AIA Office Practice Manual.	same

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Working Drawings (continued)	
Draw a plot layout plan containing: a. Only the outline of house b. Outline of other buildings on the lot c. Overall building dimensions d. Locate each building by dimensions from the property line to the building e. Show the position and size of driveways f. Show the location and size of walls g. Indicate grade elevations of key surfaces such as patios, driveways, and courts h. Outline and show the appropriate symbol for surface material used on patios and terraces i. Lable streets adjacent to the outline j. Place overall lot dimensions either on extension lines outside the property line or directly on the property line k. Show the size and location of courts l. Show the size and location of pools, ponds, or other bodies of water m. Indicate the compass orientation of the lot by the use of a north arrow n. Use a decimal scale of 1/10=1'-0" or 1/20"=1'-0" for preparing the plot plan/all drafting practices according to AIA Office Practice Manual.	
Presentation Plans	
Draw a two point perspective of a. Exterior of the building and surrounding area b. Interior of the living room.	AIA Office Practice Manual & additional references, necessary floor plans and elevations, basic drafting supplies and equipment

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Presentation Plans (continued)	
Draw a one point perspective: Kitchen (first choice) or any other selected area/meet accepted standards of AIA Office Practice Manual.	same
Plot Layout a. All out buildings b. Utilities and services c. Landscape/meet accepted standards of AIA Office Practice Manual.	same

WOOD TECHNOLOGY

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Safety	
Must wear safety glasses/according to MIOSHA and OSHA as if student were employee.	approved safety glasses
Must wear protective clothing/according to MIOSHA and OSHA as if student were employee.	protective clothing
Must use safe work habits and guards/no accidents to student or classmates.	machine guards and protection as needed
Be aware of MIOSHA regulations which are useful to students/100% on safety exams.	exam
Measurement	
Read English and metric measurements on a bench rule, tape measure or square/ 1/16", 1/8", 1/4", 1/2", 1", 1 mm, 1 dm/with 100% accuracy.	bench rule, tape measure, square
Demonstrate ability to add, multiply, divide, and move decimal points, by calculating board feet and cost of lumber.	textbook, sample problems
Planning and Design	
Design and sketch all project plans after receiving from the instructor criteria necessary for proper design and sketching.	pencil, paper, ruler

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Planning and Design (continued)	
Define and apply elements of design on all projects: line, shape, mass, color, tone, and texture/in accordance to design standards and design acceptance.	exam, projects
Define and apply principles of design on all projects: harmony, emphasis, rhythm, proportion, balance/in accordance to design standards and design acceptance.	exam, projects
Will make an isometric sketch of a project to be built./Sketch will be neat and include all necessary information for construction.	pencil, paper
Must make an orthographic sketch of a project to be built./Sketch will be neat and include all necessary information for project construction.	pencil, paper
Hand Tools	
Identify woodworking hand tools by listing the names/with 90% accuracy.	brace, hand drill, coping saw, back saw, rip saw, surforms, rasp, files, 2' bench rule, cross cut saw, hand planes, try square, carpenters square, auger bits, twist drills, hammers, marking gage, combination square, bench stop, file card, chisel, screwdrivers, spokeshave, drawknife, pull tape, cabinet scraper, scratch awl
Use basic hand wood-working tools/selection and safe utilization of proper tool for individual project.	brace, hand drill, coping saw, back saw, rip saw, surforms, rasp, files, 2' bench rule, cross cut saw, hand planes, try square, carpenters square, auger bits, twist drills, hammers, marking gage, combination square, bench stop, file card, chisel, screwdrivers, spokeshave, drawknife, pull tape, cabinet scraper, scratch awl

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Lumber	
Identify and label defects (knot, split, check, honey comb, wave and warp, and cup as described in texts and reference material) found in lumber.	textbook, Wood Handbook #72, Wood Color and Kinds, other reference materials
Identify the different parts of a piece of wood: edge, face end grain, heartwood, sapwood	wood samples
Identify wood samples as to open or close grained/ 90% accuracy.	10 samples of wood from those available
Identify wood samples according to open or closed grain, deciduous or conifer specie/5 of 10.	walnut, oak, pine, fir, mahogany, maple, red, cedar, poplar, black willow, ash or others
Hand Woodworking	
Will square a surfaced board of desired thickness/ using these tools to ± 1/16". 1. Plane best edge. 2. Mark to width. 3. Rip to width +. 4. Plane ripped edge. 5. Square one end. 6. Square other end.	crosscut saw, rip saw, back saw, coping saw, try square, combination square, jack plane, block plane, marking gage, scratch awl, and wood
Sharpen a plane iron (blade)/by visual inspection and testing on wood by the instructor; there must be no nicks, wire edge and the grind is to be at a right angle to the sides	plane iron (blade), tool grinder, try square, oil stone, plane
Shall disassemble a bench plane, clean it, assemble and adjust/so that it will take a fine, smooth cut on a board.	smooth, jack, or block plane and board
Select and use the correct file/without damaging the file or hurting themselves giving a smooth uniform surface on their stock. Identify the shape and state whether it is a single cut or double cut file/90% accuracy.	given a 20 file selection of rounds, half-rounds, flats, and triangular shapes

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Hand Woodworking (continued)	
Bore holes/straight and without tearing of the back side of the stock.	given a brace and a set of 1/4" - 1" auger bits
Saw to a line/± 1/16".	coping saw, rip and crosscut, band saw, jig saw, saber saw, radial arm saw, table saw
Select the correct chisel and make: dado joints, using rough and paring cuts/to ± 1/16" tolerance.	various sizes of socket chisels
Select the correct chisel and make: concave and convex cuts/smooth enough that no filing will be necessary after the chisel cuts.	various sizes of socket chisels
Select the proper saw when making different types of cuts and make smooth, accurate cuts/to ± 1/8" tolerance.	
Hand plane the face grain, edge grain, and end grain/to ± 1/16" on all projects.	given a jointer, smooth jack, and block plane and instruction in their correct use
Fastening	
Layout and arrange pieces of wood to be glued edge-to-edge for grain pattern, grain direction and percentage of sapwood showing/good grain pattern, all grain direction the same, and equal amounts of sapwood showing when required.	textbook, wood, glue, clamps
Tell the proper length and type of nail for fastening two boards together/so that 2/3 of the nail's length is in the second board.	test situation, paper, pencil

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Machine Woodworking	
Shall safely crosscut on the radial arm saw/square and to ± 1/64" of the given length.	radial arm saw, board, try square, ruler
Will adjust the rip fence on the table saw so it will rip a board/± 1/64" of the required width.	table saw and ruler
Will drill a 1/4" hole in pine circle and cut out the center on the jig saw so as to leave center hole in a circle/± 1/32".	wood stock, drill press, bit, and jig saw
Safely cut a wooden circle on the band saw/by properly setting up the saw and making the cut accurate to within ± 1/32".	band saw, board, ruler, compass or dividers
Saw duplicate pieces of wood on a band saw/so the parts are identical and ± 1/32" of the print.	band saw, pattern, textbook
Resaw a piece of wood/machine set up and wood is dimensionally correct/± 1/32".	circular saw or band saw, wood, ruler, textbook
Change a blade on the band saw/so both upper and lower guides must be adjusted to tolerances prescribed in the manual and the blade must track properly.	band saw, band saw blade, feeler gauge
Bore holes in round stock using a v-block and drill press/must demonstrate the proper uses of the drill press, the selection of the bit, correct spindle speed, and have stock clamped to the table, all according to textbook and blueprint requirements.	drill press, drill bits, v-block, clamp, round stock

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Machine Woodworking (continued)	
Fasten two pieces of wood together using screws and having screws hidden with a plug/must demonstrate he/she can locate holes as specified, select proper bits for boring, select correct screws, bore holes to correct depth and drive the screws so the boards are held tightly and plugs are neat and snug.	drill press, ruler, try square, multi-spur bit/spade bit, screws, screwdriver
Adjust the depth of cut on the planer so it will remove 1/16" from a rough board by measuring the board at its thickest point and setting pointer to 1/16" less than the thickest point/so finished board will be planed to desired thickness.	planes, rough board, and ruler
Must joint the edge of a board/so that it is straight and 90^0 to the best face with no chips.	jointer and board
Plane a rabbet/must set up the machine and be dimensionally correct as specified on print ± 1/64".	jointer, ruler
Rip and crosscut stock on circular saw/± 1/32" of print.	circular saw, wood, ruler, rip fence, miter guide
Select and mount the proper circular saw blade for specific operation/blade matches job, teeth point forward at top, nut is snug.	table saw, circular saw blades, textbook
Cut parts to duplicate length on a circular saw/dimensionally correct either by using a miter stop gage or clamped, block and rip fence so that piece is ± 1/32".	circular saw, clamp, block, stop gage, ruler, rip fence
Cut a rabbet joint using a single circular saw blade/must demonstrate his/her ability to set up the machine, follow accepted procedure as outlined in text and ± 1/64" of print.	circular saw, ruler, wood

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Machine Woodworking (continued)	
Shape an edge using a portable router/so the depth cut is correct, evenly cut, smooth and without burns or tears.	portable electric router, router bit, wood
Set-up and operate the sabre saw to produce the required cuts/to ± 1/16" of the layout line.	given an HP sabre saw, the necessary tools and jigs, proper instruction, and an exercise requiring the cutting of a plunge cut and external circular cuts
Set-up and operate a power hand saw to cut stock/to ± 1/16" of the layout line.	given a power hand saw, the necessary tools, proper instruction, and an assignment requiring squaring, ripping, and bevel cutting
Must find centers on a block of wood, cut spur center end, punch cup center end, set spur center, lubricate cup center, mount in lathe, adjust speed and tool rest for spindle turning on the wood lathe./ Lathe must be on slow speed and tool rest must clear stock by maximum of 1/8", and be slightly above center.	lathe, billet, back saw, wooden mallet, scratch awl, ruler and bees wax
Prepare a piece of wood for mounting on a face plate/ must be securely fastened to the face plate and close to rotating on center.	face plate, wood screws, drill press, drill bit, screwdriver, band saw, pencil, compass
Sharpen wood lathe chisels/so they cut easily and are ground to proper angles.	tool grinder, oil stone, wood lathe chisels
Set-up and operate the radial-arm saw to produce the required cuts on the assignment/to ± 1/32".	necessary tools, at least one 8" radial-arm saw, materials, measuring devices, an assignment requiring the cutting of identical lengths, bevels, miters, rip cuts, tapers, dados, and groove cuts, and a safety instruction poster

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Machine Woodworking (continued)	
Set-up and operate the belt sander/to sand a piece of stock to ± 1/32" of the dimensions.	given a stationary belt sander and stock with rough end grain, as well as an assignment and instruction over proper adjustment
Operate a portable electric beld sander on flat surfaces/without having cross sanding marks and sanding gouges in the surface.	textbook, portable electric belt sander, wood, clamp
Change the sanding belt on the portable electric belt sander/by using correct procedure as outlined in the machine instruction manual so the belt is running in the proper direction and without hitting the housing.	portable electric belt sander, sanding belt
Change the spindle on the spindle sander/correct procedure as outlined in the machine instruction manual.	spindle sander, sanding spindle
Fabricate and assemble an inset raised panel door/ + 1/64" of blueprint and cross grain sanding scratches light and minimal.	radial arm saw and/or circular saw, shaper or molding head, jointer, planer, belt sander, glue, bar clamps
Saw a tongue and groove joint/the joint must be a snug fit and flush surfaces.	radial arm saw, circular saw, ruler, dado head, textbook
Cut a dado joint/the joint must be snug and located ± 1/64" of print location.	radial arm saw or circular saw, dado head, ruler, textbook
Cut a spline miter joint on a circular saw/angle must be within 1/4°., and all other dimensions must be correct as specified.	circular saw, ruler, protractor head with blade, wood
Layout and cut an open mortise and tenon joint/so the joint fits snug and flush.	marking gauge, circular saw, dado head, wood

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Machine Woodworking (continued)	
Make a cove molding using a single saw blade on the circular saw/so molding cut is smooth, even depth, and without burns. Auxillary fence must be in front of blade.	circular saw, wooden straight edge, clamps (2), wood, rip fence
Duplicate two or more pieces on a lathe, using a duplicator attachment/within 1/32" of the master pattern.	wood lathe, duplicator attachment, wood, master pattern
Set up and use an electronic glue welder/does not burn the glue but stock is glued and out of clamps in 15 minutes.	electronic glue welder, bar clamps, glue, wood
Set up and shape the edge of a board with the molding head/so the edge is neat, evenly cut and free of burns.	circular saw, molding head, wood
Cut a taper on the jointer/± 1/64" of specified dimensions.	jointer, ruler, textbook, wood
Make wood strength tests on several different wood species/the results should be consistent with material testing manual.	wood samples, universal testing machine or homemade testing device
Evaluate the machinability of lumber and veneer core plywood/by a written report or practical application based on shaping the edge, grooving, mitering, and jointing the edge/results of which are in accordance to reference materials.	lumber and veneer core, plywood, circular saw, shaper and/or router, jointer
Be aware of new non-conventional techniques in the woodworking field by writing a report/through the use of texts and reference materials.	United States Forest Service Research Paper FLP 250, 1975

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Machine Woodworking (continued)	
Be aware of current methods of reforestation and logging that preserve the environment according to texts and other reference materials.	textbooks, movies, charts, reference materials
Formulate a construction schedule for a small piece of furniture/must meet acceptable industry standards and with minimum errors.	textbook, blueprint, paper, pencil
Adhere veneer to one surface/so veneer seams are flush and tight without ripples.	circular saw, jointer, belt sander, ruler, knife or shear, masking tape, glue, clamps or veneer press
Fabricate and assemble a flush drawer/to fit a cabinet opening with ± 1/32" in each dimension and the drawer front is flush to the surrounding surface.	radial arm saw and/or circular saw, jointer, planer, belt sander, bar clamps, glue, textbook
Hang a door using hinges/must open freely, close properly and placement of hinges be within industry accepted standards so the door is level and plumb, opens freely, and hinges are properly located according to the textbook or established furniture practices.	textbook, hinges, screwdriver, drill, and bits
Read 2 articles pertaining to various wood products operations and submit a written or oral summary indicating the sources, type of plant operation, types of equipment used, and the basic materials used.	textbook, Furniture Manufacturing and Design, Woodworking and Furniture Digest, Wood and Wood Products, Popular Mechanics, Popular Science
Distinguish between various furniture construction techniques-frame, leg and rail, box or case, carcass, and frame with cover construction of furniture/by defining or drawing each form without the help of reference material as described in text and reference materials.	textbook, furniture catalogs, picture, diagrams

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Machine Woodworking (continued)	
List uses of particle board in the furniture industry/according to the text and other reference materials.	textbook, Particle Board Design and Use Manual, National Particle Board Association
Identify parts of furniture on a written test/ 70% of the answers correct.	textbook, picture, diagram, test
Describe 5 modern manufacturing techniques used on wood products/as reported in textbooks or other reference materials.	textbook, current issues of journals pertaining to the wood products industry
Occupations	
List occupations where the worker has direct contact with wood or wood products/indicating primary function of each occupation and the training needed for each/as found in the student's local area and consistent with established practice.	textbook, job descriptions for the lumber and lumber products industries, United States Printing Office Occupational Handbook
Define the difference between a carpenter, cabinetmaker, and patternmaker/including primary function of each occupation and the training needed/as described in Occupational Outlook Handbook.	textbook, Occupational Outlook Handbook
Remove dents from wood surfaces by steam/by using water and a steam iron/so the dent is removed or can be finished easily by sanding.	steam iron, cloth, wood
Select the proper abrasive and grit number for machine belt and hand sanding/by asking for the correct type and grit number abrasive so the project will ultimately have a fine, even, scratchless finish sanding.	textbook, Coated Abrasives Reference Manual for the Woodworking Industry, Coated Abrasives Reference Chart, garnet paper

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Finishing	
Identify and use various finishing materials/ proper finish for individual project and correct utilization of finish.	oil stain, water stains, lacquer, varnish, shellac, filler, enamel paints, latex paints, finishing oils, waxes, brushes, cloth, spray gun
Identify and use properly various finishing solvents by using the proper solvent for the finish being used/without mistake.	lacquer thinner, alcohol, turpentine, water, naptha, paint thinner, oleum spirits, mineral spirits, etc.
Select and use proper techniques for furniture touch-up/matching the overall finish.	touch-up pens, finished wood, cloth, waxes, plastics, touch-up finishes
Clean a finishing brush. 1. Wipe out excess finish. 2. Wash in proper solvent. 3. Wipe dry of solvent. 4. Wash in soap and water. 5. Dry. 6. Wrap in a paper towel./To the extent that all the finish is removed and the bristles are left soft and pliable.	brush, solvent, soap and water, paper towel

GRAPHIC ARTS

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
General Graphic Arts	
Will observe all safety rules with liquids, cutting edges, equipment and eye protection/MIOSHA regulations.	
Will demonstrate good work habits by putting things back in order when done with them, and by seeing to it that his or her area is free from waste, scrap, or extra supplies at the end of every class/according to instructors stated standards.	
List a minimum of five different ways graphic communications products are used by an individual/100%.	exam
Will explain the major differences between letterpress, offset, intaglio and screen printing processes/must use standard terminology of materials and image transfer.	exam
Will identify the printing process used to reproduce a printed product/with no more than two errors.	10 samples of printed matter
Identify 9 standard types of paper: mimeo, duplicator bond, offset, watermarked bond, coated enamel, cover, gummed label, index, and carbonless.	10 paper samples

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
General Graphic Arts (continued)	
Will read and write a short report based on five articles pertaining to new printing processes or innovations in any area of graphic arts/it must be neat and cite the five articles.	trade magazines
Will read a simple job ticket and orally interpret to the instructor/all major factors must be correct.	completed job ticket
Differentiate between line copy and half-tone copy/9 out of 10.	overhead transparency samples or real samples
Will identify the different elements of a piece of handset type.	overhead isometric drawing of handset type
Will identify the spaces on a California Job Case/ with no more than 5 errors.	diagram of Job Case with spaces blank
Layout and Design	
Will list or identify these design principles: balance, contrast, rhythm, proportion, and unity/ all 5 correct.	overhead examples or exam
Will identify 4 major types of layouts: thumbnail sketches, rough layouts, comprehensive layouts, and mechanical layouts (paste-up).	overhead examples or exam

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Layout and Design (continued)	
Will identify 5 major type faces: sans serif, square serif, Roman, script, and text.	overhead examples
Make a thumbnail sketch, rough layout, and comprehensive copy containing no less than ten lines of type and one logo (sketch, line drawing, etc.) with/no typographical errors and the logo positioned such that its location is pleasing to the eye and is in harmony with the given copy.	copy provided by instructor
Will identify any given point on a pica rule/to nearest increment.	a diagram showing several markings on a pica rule
Set and interpret a proportion scale/produced copy must fit keyline area.	copy and scale
Composition	
Will prepare a paste-up using the 7 cold type elements/suitable for camera-ready copy.	transfer letters, impact letters, photographic letters, original art, clip art, adhesive screen or border, repro proof
Compose handset type/all lines are fully justified, all words spelled correctly, no wrong font letters, and spacing is per copy layout specifications.	foundry type in cases, composing stick, line gauge, galley, galley storage cabinet, proof press, proofing ink, proofing paper, string
Will demonstrate two different ways to store a handset composition/no pi.	a multi-line handset type form, string, galley

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
General Photography	
Will identify the four basic parts of a hand-held camera/lens, shutter, film holder, light proof container.	overhead illustration of simple box camera
Will list the five basic parts of a process camera/ lens, bellows, camera back, copyboard, lights.	overhead illustration of process camera
Determine the base and emulsion side of a piece of exposed and developed film/9 of 10 tries.	sample pieces of film
Will explain in writing the difference between orthochromatic and panchromatic film/standard difference.	exam
Describe the darkroom tray arrangement and explain the purpose for that order/100%.	oral exam
Demonstrate how to make a photogram/instructor's standard.	darkroom, piece of unexposed ortho film or print paper, objects to place on film
Expose and develop a photo mechanical transfer (PMT)/so finished product is as good or better than original.	copy, camera, PMT positive and negative paper, processor
Panchromatic Photography	
Expose a roll of film in a simple camera by taking pictures outdoors, or indoors with a flash unit/ all pictures have clearly recognizable images suitable for printing with no noticable camera movement visable.	simple camera (such as an Instamatic 124 using 126 size film), black-and-white film for the camera selected

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Panchromatic Photography (continued)	
Prepare the chemicals for processing panchromatic film/with trays properly positioned; water temperature will be set at 68 degrees; developer, stop bath and fixer will be made to the proper manufacturer's specifications.	developer, stop bath, fixer, water, trays
Process a roll of black-and-white film/all picture areas are developed with no fingerprints or "moons" showing.	developing tank with reel processing solution, thermometer, wash water, totally dark room
Prepare a "gang proof" of negatives from a roll of black-and-white film/all negative numbers are visible, all pictures are reasonably well exposed, and the proof sheet is indexed for storage purposes.	"gang proofer", chemicals in trays, 3 print tongs, projection paper, dark-room with safelight, wash sink, print dryer
Prepare a projection print/margins are uniform in size and print has sharp focus and good density range.	enlarger, chemicals in trays, print tongs, dark-room with safelight, useable negative, projection printing paper with test strips, washer, print dryer
Mount a print for display/print is trimmed square with the mount, no bulges or wrinkles show on the surface, and proper identification is on the back.	finished print, mounting board, print adhesive, art gum eraser

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Orthochromatic Photography	
Utilize the process camera to position and shoot line copy film for a specific percentage/the f-stop, copyboard, lensboard control will be set according to the manufacturer's recommendations. The copy will be centered on the copyboard. The film will be cut to 1 1/2 to 2 inches larger than the copy. The exposed film, after developing, will be in agreement with available resource materials.	film, process camera
Prepare the chemicals for processing orthochromatic film/with trays properly positioned; water temperature at 68 degrees; developer, stop bath, and fixer will be made to the proper manufacturer's specifications.	developer, stop bath, fixer, water, trays
Process a piece of film shot at 100%/the camera will be set at the specific percentage. A Stouffer sensitivity guide will be placed next to the copy. The development will be carried out to a solid 4 on the Stouffer Strip. Under normal room light conditions the step 4 will be black or nontransparent.	process camera, process chemical film, Stouffer Strip
Stripping	
Will draw out a blank masking sheet with the necessary lines so that it could be used for the press present in your graphic arts class and be accurate to ± 1/16 inch on the centerline, and exact measurement on the clamp and gripper margins.	blank masking sheet, T square, writing and measuring instruments

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Stripping (continued)	
Prepare a single page flat to strip up for an offset press. A negative of an 8 1/2 x 11 letter will be stripped into a flat/the placement and squareness accuracy will be 1/16".	specifications on how the negative will be positioned, masking sheet, negative, light table, T square, Exacto knife
Opaque all unwanted spots on negative/so plate will be free of spots or blemishes.	opaque solution, brush, prepared flat, light table
Platemaking, Nonphotomechanical	
Prepare a direct image offset printing plate (master) using each of the items provided/ the design is correct size and properly located in the designated printing area.	direct image plate (master), nonreproducing pencil, reproducing pencil, reproducing pen, china marker, typewriter with reproducing ribbon
Describe two advantages and disadvantages of using a direct image plate.	exam
Platemaking, Photomechanical	
Will expose, develop, and preserve an additive presensitive aluminum printing plate/with no errors.	aluminum printing plate, flat, plate developing, and preserving supplies
Will expose, develop, and preserve a subtractive presensitive aluminum printing plate/with no errors.	aluminum printing plate, flat, plate developing, and preserving supplies

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Press Work-Letterpress	
Carve a linoleum block and print twenty-five copies twice/having 23 out of the 25 pairs register exactly over the previous impression.	linoleum block 2 x 3", carving knives, platen press, appropriate supplies
Print composed handset type on a platen press (pilot or handfed open platen)/image is registered per copy layout specifications (± 1 point accuracy); no impression visible on reverse side of sheet; solid ink coverage without slurring, no fingerprints on the printed sheets, not more than 10% spoilage beyond the 5 makeready sheets.	platen press, chase to match press, ink, makeready materials, gauge pins, line gauge, imposing table, furniture, quoins, quoin key, planer block, drying rack
Press Work-Offset	
Mix fountain solution/according to manufacturer's ratio.	chemicals and manufacturer's specifications
Set up and run offset duplicator (metal plate) producing/at least 35 quality sheets out of the 50 sheets provided.	ink, offset duplicator, metal plate, 50 sheets of stock
Wash up offset duplicator/all rollers, fountains, cylinders and equipment free of ink and dirt.	offset duplicator, necessary clean up supplies
Set up and run offset duplicator (direct image plate) producing/a minimum of 35 quality sheets out of the 50 sheets provided; no finger prints appear on printed sheet and image is in register ± 1/16".	offset duplicator, direct image plate, 50 sheets of stock

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Screen Printing-Hand Cut	
Cut a laquer or water soluble film stencil design for screen process printing/all design edges are sharply cut with no pressure mark visible on the back side of the stencil material and the stencil matches the original design.	cutting surface, stencil cutting knife, design, masking tape; laquer film or water soluble film
Print a laquer film or water soluble film stencil design on either paper or cloth/image correctly registered within ± 1/32" of original design specifications, no smears or fingerprints on the finished product, and the screen is completely cleaned ready for re-use at the completion of the process.	cut stencil, printing frame, adhering liquid, clean rags, register guides, stock to print on, squeegee, correct inks, drying racks, wash up solvent, rag can
Screen Printing-Photo	
Will prepare a project of his/her own choice for photo silk screen and prepare it for printing/ photo stencil will be exposed and developed according to the manufacturer's specifications and adhered so as to be useable for printing.	photo stencil, photo screen film, developer, silk screen and frame
Print a photo film stencil design on either paper or cloth/image correctly registered within ± 1/32" of original design specifications, no smears or fingerprints on the finished product, and the screen is completely cleaned ready for re-use at the completion of the process.	photo film stencil, printing frame, clean rags, register guides, stock to print on, squeegee, correct inks, drying racks, wash up solvent, rag can

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Intaglio	
Prepare an intaglio printing plate by the dry-point technique on a piece of plastic/the completed plate contains a variety of line depths and shadings as dictated by the original design and contains the student's name in reverse for correct printing.	suitable design, engraving tools, plastic plate, piece of black paper same size as plate
Print an intaglio plate by hand/the design is clearly visible in relation to the background and the ink color is suitable to the design idea.	engraved plate, intaglio printing press, dampened paper, appropriate color ink, packing blotter, drying rack, cleaning solvent, clean rags, rag can
Bindery Operations	
Cut paper to press size from stock sheets/all sheets are squarely cut to within ± 1/64" of indicated press size, no clamp marks or fingerprints on cut sheets.	cutting diagram, lever cutter, stock to be cut
Set up and operate the folding machine/1/32" accuracy on all sides, 50 sheets of 8 x 10 will be folded to 5 x 8.	folder stock
Pad and trim 10 pads of 25 sheets plus chipboard/the padded edge is smooth with no "runs" and the other three sides are trimmed identically to within ± 1/64" of specifications and no cutter clamp marks appear on any of the sheets.	printed sheets, padding compound, brush, padding press, chipboard the size of the printed sheets, padding knife, lever paper cutter

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Bindery Operations (continued)	
Mechanically fasten 20-50 sheets of paper and cover to form a booklet/all edges are trimmed even and smooth to within + 1/64" of design size, there are no projections to cut or scratch on the fastening devices, and pages are in correct sequence.	cut stock and covers, plastic binding strip, binding punch/ assemble
Set up and operate the paper drill/set up for a 1/4" standard three hole drill according to the manufacturer's specifications and safety procedures. A 1/32" accuracy required.	paper drill, stock

DESIGN AND SKETCHING

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Sketch a basic cube in isometric pictorial, cabinet, cavalier, one-point, and two-point perspective to correspond to instructor provided key.	8-1/2" x 11" white unlined paper (one sheet for each sketch) and H (HB, F) pencil or lead holder.
Sketch a basic cube, cylinder, cone, and sphere in isometric pictorial form to correspond to instructor provided key.	8-1/2" x 11" white unlined paper (one sheet for each sketch) and H (HB,F) pencil or lead holder.
Sketch a simple three dimensional object that encompasses the majority of simple shapes to correspond to instructor provided key.	8-1/2" x 11" white unlined paper and a H (HB, F) pencil or lead holder.
Draft and render a simple cube, cylinder, cone and sphere using each of the rendering techniques: line contrast, parallel lines, stippling and smudge shading to correspond to instructor provided key.	8-1/2" x 11" white unlined paper (one sheet for each drawing) and a H (HB, F) pencil or lead holder.
Airbrush four simple shapes, including a cube, cylinder, cone and sphere to correspond to instructor provided key.	8-1/2" x 11" sheet of heavy drawing medium on which to airbrush a basic shape (one sheet for each drawing), airbrush equipment, inks, and a drawing board, T-square, 45°, 30-60° triangles (drafting machine), drafting paper, drafting tape, bow compass, drafting pencils (lead holder), divider, architect's and/or mechanical engineer's scale.
Organize the five steps of the design analysis method: statement of the problem, analysis and research, possible solutions, experimentation, and final solution to correspond to procedures and definitions provided by instructor.	a handout sheet with the directions for organization of the design analysis method

DESIGN AND SKETCHING

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Organize, with the design analysis method, a true design and a redesign problem to correspond to procedures and definitions provided by instructor.	any type of simple problem, (i.e., redesign handle on coffee pot or design object to mix salad) and a drawing board, T-square, 45°, 30-60° triangles (drafting machine), drafting paper, drafting tape, bow compass, drafting pencils (lead holder), divider, architect's and/or mechanical engineer's scale.

MECHANICAL DRAFTING

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Occupational Information	
State how drafting is used in the design and production manufacturing process, by listing five (mm) ways it is used as presented in Dictionary of Occupational Title.	Instructor presentation and class discussion (guest presenter, field trip to drafting and manufacturing site information sheets).
Equipment Care and Use	
Identify and give one use of the drafting tools and supplies used in basic drafting practices, as specified in ANSI Standards.	Drawing board, T-square, 45°, 30-60° triangles (drafting machine), bow compass, protractor, eraser, erasing shield, irregular curve, mechanical engineer's scale, architect's scale, millimeter scale, drafting tape, circle template, ellipse template, drawing pencil (4H, 2H, H, HB, F), lead holder, drafting tape, and dividers.
Measure any eight and draw any eight specified angles between 1° to 360° (at least one in each quadrant) with ± 1° accuracy.	Protractor (drafting machine) straight-edge, pencil or lead holder.
Scale the lengths of six lines and draw six lines to different specified scales and lengths to tolerances ± 1/32".	Architect's scale (or mechanical engineer's scale), straight edge, pencil (lead holder), drawing paper, instructor specified line lengths and scales.
Scale the lengths of five lines and draw five lines to a specified scale and lengths/to tolerances ± 1/32".	Metric scale, straight edge, pencil (lead holder), drawing paper, instructor specified line lengths and scales.
Basic Drafting Techniques	
Letter each commercial gothic single-stroke vertical and inclined letter and numeral/with all of the letters and numerals formed correctly per standards specified. ANSI STANDARDS.	Drawing board, T-square (drafting machine), scale, drawing paper, drafting tape, lettering guide, and H-pencil (F, HB, 2H), or lead holder

MECHANICAL DRAFTING

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Basic Drafting Techniques	
Draft the following geometric constructions: 1) bisect a line, (2) bisect an arc, (3) bisect an angle, (4) divide a line into any number of equal parts, (5) perpendicular to a line from a point on the line, (6) perpendicular to a line from a point off the line, (7) transfer an angle, (8) draw a square, (9) draw a hexagon, (10) draw an octagon, (11) draw a circle through any three points, (12) draw an arc tangent to two intersecting lines, (13) draw an approximate four-center ellipse/$\pm$ 1/32" minor measurement errors, but no construction errors.	Drawing board, T-square, 45°, 30-60° triangles (drafting machine), drafting paper, drafting tape, bow compass, drafting pencils (lead holder), divider, architect's and/or mechanical engineer's scale.
Draft the following geometric constructions: (1) hyperbola, (2) parabola, (3) involute, (4) helix, (5) cycloid, (6) pentagon w/ 80 accuracy	Drawing board, T-square, 45°, 30-60° triangles (drafting machine), drafting paper, drafting tape, bow compass, drafting pencils (lead holder), divider, architect's and/or mechanical engineer's scale.
Identify the alphabet of lines typically used in engineering drawing/100 percent correctly.	Drawing(s) with examples of the following lines: (1) construction, (2) object, (3) hidden, (4) border, (5) center, (6) extension, (7) dimension, (8) leader, (9) phantom
Orthographic Projection	
Illustrate the correct projection of the three principal orthographic views/to correspond to an instructor provided key. Minor $\pm$ 1/32" measurement errors, but no construction or projection errors.	Bow compass, triangles (30°-60° and 45°), dividers, drawing board, T-square, (drafting machine), scale, drawing paper, pencil (lead holder)
Oblique	
Draft four oblique drawings (two cabinet and two cavalier) with $\pm$ 1/32" minor measurement errors but no construction errors.	Drawing board, T-square, 45°, 30-60° triangles (drafting machine), drafting paper, drafting tape, bow compass, drafting pencils (lead holder), divider, architect's and/or mechanical engineer's scale.

MECHANICAL DRAFTING

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Isometric	
Draft three isometric drawings a) one containing isometric lines, b) one containing non-isometric, c) one containing isometric curve or circle with ± 1/32" tolerance and minor measurement errors but no construction errors.	Drawing board, T-square, 45°, 30-60° triangles (drafting machine) drafting paper, drafting tape, bow compass, drafting pencils (lead holder), divider, architect's and/or mechanical engineer's scale.
Draw a shaded isometric drawing using accepted shading standards found in ANSI Standards.	Drawing board, T-square, 45°, 30-60° triangles (drafting machine) drafting paper, drafting tape, bow compass, drafting pencils (lead holder), divider, architect's and/or mechanical engineer's scale.
Draw an isometric working drawing using accepted standard found in ANSI Standards.	Drawing board, T-square, 45°, 30-60° triangles (drafting machine) drafting paper, drafting tape, bow compass, drafting pencils (lead holder), divider, architect's and/or mechanical engineer's scale.
Perspective	
Draft two-one point and two-two point perspective projection ± 1/32" minor measurement errors, but no construction or projection errors.	Drawing board, T-square, 45°, 30-60° triangles (drafting machine), drafting paper, drafting tape, bow compass, drafting pencils (lead holder), divider, architect's and/or mechanical engineer's scale.
Auxiliary Views	
Identify the type of drawing (isometric, cabinet, cavalier, orthographic, one-point, two-point and three-point perspective, assembly, casting, fabrication, floor plan - 100%.	Minimum of 11 different drawings or sketches.

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Sections	
Draft five different sectional views consisting of: (1) full, (2) half, (3) offset, (4) re and (5) broken-out/to correspond to ANSI Standards with ± 1/32" minor measurement errors, but no construction or projection errors.	Drawing board, T-square, 45°, 30-60° triangles (drafting machine), drafting paper, drafting tape, bow compass, drafting pencils (lead holder), divider, architect's and/or mechanical engineer's scale.
Detailing	
Draft a thread representation drawing with detail, schematic, and simplified representation with ± 1/32" minor measurement errors and no construction or projection errors.	Drawing board, T-square, 45°, 30-60° triangles (drafting machine), drafting paper, drafting tape, bow compass, drafting pencils (lead holder), divider, architect's and/or mechanical engineer's scale.
Dimension eight completed detail working drawings with at least two each of the following: (1) casting, (2) fabrication, (3) machine part, (4) simple assembly using correct dimensioning procedures/as specified by ANSI Standards.	Drawing board, T-square, 45°, 30-60° triangles (drafting machine), drafting paper, drafting tape, bow compass, drafting pencils (lead holder), divider, architect's and/or mechanical engineer's scale and metric scale.
Surface Development	
Draft two parallel-lines and two radial-line developments with ± 1/32" measurement errors, but no construction or projection errors.	Drawing board, T-square, 45°, 30-60° triangles (drafting machine), drafting paper, drafting tape, bow compass, drafting pencils (lead holder), divider, architect's and/or mechanical engineer's scale.
Cams	
Draft one problem each dealing for a radial cam with a pointed follower, a radial cam with a roller follower, a radial cam with a flat face follower. Each cam is to be drafted with constant velocity, harmonic, and uniformly accelerated motion with ± 1/32" minor measurement errors.	Drawing board, T-square, 45°, 30-60° triangles (drafting machine), drafting paper, drafting tape, bow compass, drafting pencils (lead holder), divider, architect's and/or mechanical engineer's scale.

METAL TECHNOLOGY

Career Knowledge

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Identify several metal job titles as semi-skilled, skilled, engineer, technician, product designer/ 8 out of 10.	description of the five occupational levels, list of job titles for metals occupations
Explain briefly the entry qualifications for five metal occupations/must include educational level, skill level and personal characteristics.	list of selected entry level metal occupations
List ten occupations related to casting and describe the duties of each/80% accuracy.	pencil, paper

Safety

Describe the proper attire for working in a machine shop. 100% OSHA--MIOSHA specifications.	without the use of reference materials
State the safety rules for the lathe, vertical mill, drill press, pedestal and surface grinder, and power hand tools. 100% OSHA--MIOSHA specifications.	without the use of reference materials
Identify a safe grinding wheel./100% of the time.	given any grinding situation
Answer/20 out of 20 correctly on a safety examination/100%.	text, safety quiz, safety glasses, shop coat, shop rules and regulations, handouts
Exhibit his awareness of safety. He will do so by wearing safety glasses in the laboratory and by following all the laboratory safety rules/100% of the time.	safety glasses, safety face shields, and list of lab safety rules

General Information

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Point out regions of important metal deposits located in U.S./according to the text book and supplementary material.	large map of U.S., text
Explain why certain cities became steel producers around the Great Lakes Region/according to the text-book and supplementary material.	pencil and paper, map of U.S., books
Identify modes of transportation for metals from raw material to finished products/according to the text book and supplementary material.	pencil and paper, books
Explain the relevance of metals to our technology and economy/according to the text book and supplementary material.	pencil and paper, books
List five principle metal manufacturing industries in the U.S./according to the text book or a reference.	paper and pencil, reference or text
Match the methods of mining to the major metal ores/ according to text book and supplemental references without mistake.	reference books, paper, pencil, list of metallic ores, list of mining methods
Explain how five metals are refined/according to text book and supplemental material.	reference books, paper, pencil, list of 5 common metals
List 3 general characteristics peculiar to each of the five common metals/according to the text book without error.	paper, pencil, list of 10 common metals, text or reference material
Classify metals into 2 general groups (ferrous & non-ferrous)/100%.	paper, pencil, metal samples, magnet, chemical formulas

General Information (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Determine which metals are alloys/100%.	paper, pencil, list of metals and their chemical formulas
Match metallic ores with the resulting metal using reference material/100%.	reference books, paper, pencil, list of metals
Cite five product examples for each area: food preparation, clothing, housing, power, communication, transportation, manufacturing, recreation, security/with 100% accuracy.	
Define five common properties of metal/with 100% accuracy.	list of properties, paper, pencil
List five common alloying elements used in steel/to 100% accuracy.	pencil, paper
List 3 classes of carbon steel & give general example of its use/according to text or reference.	pencil, paper
Discriminate between the cold & hot rolled steels/ to 100% accuracy.	samples of hot and cold rolled steel
Name in writing the 3 systems for identifying steels/ with 100% accuracy.	paper & pencil
Describe how carbon content affects the hardenability of steel/according to text or reference.	paper, pencil
Describe three effects of mining or smelting on the environment/100%.	pencil, paper, reference material, discussion

General Information (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Match metals to products based on simple physical, electrical, or chemical properties/80%.	list or samples of metals and list of product applications
Lay out a plan of procedure and bill of metal materials for a given project/must include all parts and all tasks at an appropriate level.	paper, pencil, ruler, required or selected project idea, planning sheet
Compute material cost based on bill of materials/ ± appropriate amount based on size of project.	bill of materials, price list
Properly identify a machine screw/by giving the number of threads per inch and diameter.	machine screw, screw pitch gage, micrometer
Identify 6 common head styles, 2 common nut shapes/ at 95% accuracy on a test.	a display chart of the common threaded fasteners, nuts and washers
Identify a machine bolt, cap screw, machine screw, stud, set screw, lug bolt, self tapping screw and will specify the use of each/at 95% accuracy on a test.	a display chart of the common threaded fasteners, nuts and washers
Identify the grinder, motor wheel guard, tool rest, switch, eye shield, and pedestal with 100% accuracy.	grinder
Dress the grinding wheel/sharp and true.	given a grinder and a star dresser
Sharpen a set of twist drills/correct and even lip angles 100% of the time.	a drill sharpening attachment, and drills
With the use of a screw pitch gage, the learner will identify a 3/4 x 10 N.C. 2A thread series/100% accuracy.	sample threaded rods, screw pitch gage

General Information (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Select proper coolent for material/according to those prescribed.	instructor prepared list or published list
Identify the necessary lubrication on the metal-working machines. 90% accuracy.	machines, oil & grease, lubrication charts
Read a micrometer/± .001.	micrometer
Read a ruler/± 1/64.	ruler
Identify various ferrous and non-ferrous metals/ 90%.	samples of metals
Identify various material shapes: a. round, b. hexagon, c. octagon, d. square, e. flat strip, f. sheet plate, g. angle, h. channel, i. pipe./90%	
Explain how steel is made. 80% accuracy.	by using the library and writing a paper on the subject
Describe how steel is hot rolled at the mill. 80% accuracy.	without the use of reference materials
Describe how round steel is cold rolled at the mill. 80% accuracy.	without the use of reference materials
Locate various dimensions of parts on blueprints (length, width, heighth, location of holes, and all special features). 90% accuracy.	blueprint
Identify the parts of a drill: web, cutting edge, clearance, shank, flutes, tang, margin, point./90% accuracy.	twist drill

General Information (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Name four ways drills are categorized by size: letters, fractions, numbers, millimeters.	without the use of reference materials
Given 6 drills, select/one carbon, one high speed, one taper shank and one straight shank. Describe use of four types of drills; i.e. H.S.S./100% accuracy.	carbon drills, high speed drills, taper shank drills, straight shank drills, carbide drills, quick change drills
Given 10 different files, name them by shape, tooth cut, spacing/90% accuracy.	single cut file, double cut file, curved tooth file, flat file, knife edge file, 3 square file, round file, square file, half round file
Counterbore a hole for a 3/4" socket head screw/to specifications on blueprint (job).	lathe and tooling, How to Run a Lathe Manual, 1" dia x 3" CRS, drill index, reamer set, excercise print, set of counterbores, drill index, counterbore nomin-clature
Measure four out of five objects/± 1 mm.	sample objects, metric ruler
Identify/ 3 out of 4 sheet abrasive materials.	emery cloth, crocus cloth, wet/dry silicon carbide paper, aluminum oxide paper
Identify 3 pieces of steel, by sparktesting each/100% accuracy.	benchgrinder and 3 identically shaped pieces of steel: one high carbon, one medium carbon, and one low carbon
Fasten two pieces of metal using assorted fasteners. The metals fastened will fit tight.	assorted screwdrivers, assorted wrenches, pop rivet gun, drills and countersinks, drill press or hand drill, assorted fasteners
Read a micrometer at any size using transfer and helper measuring tools/as specified by the blueprint/ 90% accuracy.	calipers, telescoping gages, small hole gages, micrometers

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Sheet Metal

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Square a piece of sheet metal/to ± 1/64" of given specifications.	parallel line pattern, squaring shear, metal
Cut sheet metal/± 1/16" of the scribed line.	portable electric shear or tin snips, metal
Operate turning machine for standard operations/ quality of fabricated part as determined by its intended usage.	rotary machine with beading, crimping, wiring, burring, and turning rolls, blueprint, sheet metal
Tin a soldering copper/filed smooth and flat, and excess solder wiped off.	soldering copper, sal amoniac, solder, source of heat, file, cloth
Make a grooved double seam or folded countersunk seams/ so they are neat and hold together.	necessary hand tools, folding equipment, sheet metal, prints, list of seams
Lay out the outside form of a product ± 1/64" for bench project/± .003 machine tool project.	print of C-clamp project, bluing lay out tools, 3" x 3 9/16" sheet metal
Layout and construct a sheet metal product with hems and tabs/which conforms to a drawing ± 1/32".	sheet metal, scratch awl, rule, square, tin snips, brake, spot welder (solder or riveter)
Solder a hole in a can using gun/100% accuracy in 5 minutes.	soldering gun, soldering copper, solder, fluxes, materials, and requisite knowledge
Solder two pieces of tin plate sheet metal together using soldering copper: tacking, spreading, and sweating. The joint will pass a tear test.	soldering gun, soldering copper, solder, fluxes, materials, and requisite knowledge
Make bends using a straight edge and clamp on bench top/100% accuracy.	patterns, sheet metal, necessary tools, fasteners for sheet metal bar folder, pan brake, forming rolls, spot welder, stakes, benders, accessories, and requisite knowledge

Sheet Metal (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Make bends using hand seamer/100% accuracy.	patterns, sheet metal, necessary tools, fasteners for sheet metal bar folder, pan brake, forming rolls, spot welder, stakes, benders, accessories, and requisite knowledge
Shape sheet metal cylindrically or conically on forming rolls/100% accuracy.	patterns, sheet metal, necessary tools, fasteners for sheet metal bar folder, pan brake, forming rolls, spot welder, stakes, benders, accessories, and requisite knowledge
The student will correctly and safely set up and spot weld two different thicknesses of sheet metal/ 80% of the time.	Spot welder, safety apparel
The student will correctly and safely set up and solder the corners of a box/The box will not leak when filled with water.	Soldering iron or soldering copper, solder, and soldering flux
The student will cut, bend, and hem sheet metal/ to print requirements $\pm 2^{0}$ of angle and 1/32" of width and length.	Shear, bending brake, finger brake, and bar folder
The student will read basic blueprints and correctly lay out the design on sheet metal/The lines will be within 1/32" of the print requirement.	Scratch awl, combination square, dividers, and ruler
Prepare edges using all of the following methods: wire edge, hem, filed/edges will be dent and burr free. 100%.	Rotary machine, hand seamer and bending brake, file

Sheet Metal (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Fasten sheet metal using all of the following: solder; rivet; pop rivet; spot weld; seam; or sheet metal screw/joint will be tight and neat.	Solder and soldering gun, copper or torch; drill and bit, rivets, ball pene hammer, rivet set; Drill and bit, pop rivet and pop rivet gun; spot welder; hand groover, hammer or box and pan brake, hand seamer; sheet metal screws. screwdriver, drill and bit
Identify the following sheet metals: tin plate; copper; brass; sheet steel; aluminum; lead; and galvinized/100% accuracy.	U.S. Standard Sheet Metal Gage for ferrous and Brown & Sharp, or American Sheet Metal Gage for nonferrous metals
Identify the following industrial sheet metal equipment: a. aviation tin snips, b. straight tin snips, c. power shears, d. sheet metal punch, e. stakes and stake holder, f. rawhide mallet, g. hand seamer, h. hand groover, i. C-clamps, j. slip rolls, k. bench shears, l. box and pan brake, m. bar folder, n. corner cutter, o. rivet set, p. soldering copper or gun, q. spot welder, r. pop rivet gun, s. blow torch, and t. soldering furnace. 100% accuracy.	Field trips and hand-outs
The student will correctly and safely prepare a metal item for finishing, and place a finish on that item/ The finish will be free from blemishes.	Metal etching or sand blaster, spray painting gun, paint, spot putty, and sand paper
Bench Metal	
Identify and demonstrate safe use of three stakes/ name accurate, actions be safe and reflect stakes intended usage.	bench with stake plate, variety of stakes, hand tools, sheet metal, plans

Bench Metal (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Identify and demonstrate safe use of metal sanders/metal is smooth and flush to line, wear safety glasses.	disc sander, belt sander, sheet metal project, safety glasses
Grind a cold chisel cutting edge/± 2° of the correct angle.	grinder, dull cold chisel, desired angle
Bend and twist heavy metal/to specifications on plan.	machine bender, monkey wrench, or vise held bending devices, heat source if needed
Identify each of the screw plate parts(taps, dies, tap handle, die stock)/100% accuracy.	screw plate, paper and pencil
Select the correct hacksaw bald for the operation, 100%.	metal hacksaw and blueprint
Select a correct tap drill from a chart/100%.	Charts
The learner will lay out holes, angles, radaii to print specifications/90%.	metal, ruler, scribe, divider, protractor, blueprint
Saw a piece of metal/± 1/32".	metal, ruler, scratch awl, hacksaw
File a piece of metal so that/it is smooth and square/± 1/32".	metal, square, file
Cut internal and external threads/so that they fit correctly together.	metal, tap, tap wrench, die, die stock, cutting fluid, tap drill chart, tap drill, drilling machine
Bend and shape wire on wire former/100% accuracy.	patterns, sheet metal, necessary tools, fasteners for sheet metal bar folder, pan brake, forming rolls, spot welder, stakes, benders, accessories, and requisite knowledge

Bench Metal (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Twist or bend band iron/100% accuracy according to blueprint or true size and shape drawing.	patterns, sheet metal, necessary tools, fasteners for sheet metal bar folder, pan brake, forming rolls, spot welder, stakes, benders, accessories, and requisite knowledge
The student will - make a measurement with: inside micrometer, outside micrometer, vernier height gauge, vernier protractor, and a surface plate/at least two times and measurements shall be ± .001 of an inch, or within one degree on the protractor.	blocks of various sizes and shapes and measuring tools
The student will correctly and safely prepare a metal item for finishing and place a finish on that item/The finish will be free from blemishes.	metal etching or sand blaster, spray painting gun, paint, spot putty, and sand paper
Art Metal	
Demonstrate these art metal techniques: tapping, chasing, design stamping, metal tooling, piercing, sinking, beating down and raising/without any unnecessary holes, dents, tears, or sharp edges.	necessary tools and non-ferrous metal parts
Demonstrate these art metal techniques: planishing, doming, fluting, scalloping, flaring, overlaying, etching, and enameling/with distinct detailing of lines and shapes.	necessary tools, non-ferrous metal, chemicals, enamels
Pickle and anneal copper, brass, or aluminum projects/so as to allow finishing the project without any tears, dents, dirt, or oil.	source of heat, pickling and annealing materials, copper, brass, or aluminum

Art Metal (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Apply either a satin, high luster, or colored finish to preserve art metal/without any scratches, dents, dirt, runs, or excessive coloring.	power buffer, various buffing compounds, various buffing wheels, liver of sulfur, lacquer, plastic, or wax
Set-up and spin a metal bowl/without any wanes, wrinkles or irregular sharp edges.	metal spinning lathe, spinning tools, various wooden chucks, round piece of non-ferrous metal
Buff copper and/or brass using jeweler's rouge and/or tripoli on buffing wheel/to blemish free finish.	patterns, sheet metal, necessary tools, fasteners for sheet metal bar folder, pan brake, forming rolls, spot welder, stakes, benders, accessories, and requisite knowledge
Powdered Metal	
Identify 12 terms that are associated with the powdered metallurgy industry/90% accuracy.	
By examining 3 pieces of processed metal, the learner will be able to identify 2 of the pieces as being produced by powdered metallurgy.	
Lathe	
Setup collets for turning small diameters/work-piece must not slip in collet.	engine lathe, collets, metal
Center irregular material in the chuck to facilitate drilling on previously located point.	four jaw chuck, dial indicator

Lathe (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
The learner will identify parts of the lathe such as, the lathe, headstock, tailstock, carriage bed, gear box, lead screw, 3-jaw chuck, feed levers/100% accuracy.	engine lathe
The learner will set up the lathe to perform the following operations: turning, facing, knurling, taper cutting with the compound rest, and drilling/90% accuracy.	engine lathe
The learner will set the lathe for the following movements: cross-feed (in and out), longitudinal feed (left and right), 100% accuracy.	engine lathe
The learner will straight turn to a/Tolerance ± .003.	lathe, micrometer, stock
The learner will face and centerdrill/work to within .015 of center.	lathe, stock, combination drill and countersink
The learner will align the lathe centers/± .001.	lathe, test bar indicator
Turn a knurl on a piece of stock so the diamond/ design will be to a point.	lathe, stock, knurling tool
The learner will cut an external thread to specifications on the blueprint.	lathe, threading tool, thread micrometer, print
The learner will cut a taper by the compound method and/or taper attachment ± 1^{o}.	lathe, stock, blueprint
The learner will describe the following terms: facing, turning, knurling, chamfer, ream, taper, abrasive, peen, thread/90% accuracy.	without the use of reference materials

Lathe (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Identify parts of turret lathe/100% accuracy.	turret lathe, accessories, necessary tools, and requisite knowledge
Operate turret lathe to produce duplicate pieces/ 90% accuracy.	turret lathe, accessories, necessary tools, and requisite knowledge
Grind a lathe cutting tool/it will cut the material and fit the operation for which it is designed.	a tool blank
Mount a chuck securely, /in accordance with operation manual/100% accuracy.	engine lathe, spanner wrench, chuck, (Universal or independent) chuck board
Clean and reverse the jaws of a chuck/in accordance with operation manual/100% accuracy.	engine lathe, 3-piece reversible jaws, chuck wrench, chuck tread, I.D., O.D. cleaning tool
Bore a hole on lathe/to the tolerance and specifications of the blueprint.	engine lathe, boring bar and bit pilot drills, oil, chuck drill, blueprint
Securely set up a work piece on a mandrel for turning/as specified by the blueprint.	engine lathe, piece of stock blueprint, tool bits, mandrel live and dead centers, face plate and lathe dog
Horizontal Mill	
Machine the tooth form/from the print to an accuracy of ± .002.	index head, a formed tooth cutter, and the horizontal milling machine
Use the index on milling machine so that piece ends up/with proper number of sides of equal size and to within .031 of designated thickness.	mill, index

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Horizontal Mill (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Identify: climb milling, conventional milling/ 100% accuracy.	given a diagram
Set up and use 5 methods of clamping work for machining/100%.	vices, C-clamps, hold downs and T-bolts, angle plates, V-blocks
Name six milling cutters and give one use for each/100%.	6 mill cutters
Cut a keyway/100% accuracy.	milling machine, cutters, accessories, necessary tools, and requisite information

Vertical Mill

Use index on milling machine so that piece ends up/with proper number of sides of equal size and to within .031 of designated thickness.	mill, index
Identify the parts of a vertical milling machine: table, spindle, knee, saddle, etc./100% accuracy.	vertical milling machine
Mount vise parallel to bed of a mill/$\pm$ .003 tolerance.	vertical mill, vise, dial indicator
Set up and use 5 methods of clamping work for machining/100%.	vice, C-clamps, hold downs and T-bolts, angle plates, V-blocks
Tram the head of the milling machine to a total indicator reading of $\pm$ .001.	vertical milling machine dial indicator, wrenches

Vertical Mill (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Locate the center of the spindle over a reference point and all succeeding points within ± .001".	vertical milling machine and blueprint
Drill, bore and counterbore to specifications on the blueprint/100% accuracy.	vertical milling machine, piece of stock and a blue print
Identify and select for use, end mills, fly cutters, shell mills, slitting saws, and key cutters/to tolerances and specifications of the blueprint/100% accuracy.	vertical milling machine stock, and blueprint
Mount and perform the operations of: rapid index device, dividing head, rotary table/to tolerances and specifications of the blueprint/100% accuracy.	vertical milling machine, piece of stock, blueprint, rapid index device, dividing head, rotary table
Shaper	
Identify the parts of a shaper: table, clapper, clapper box, ram, column, base, apron, control mechanisms/with 100% accuracy.	shaper or illustration
Safely square a piece of stock on the shaper/± .003.	shaper, dial indicator, sharp tool bit, parallels, feed and speed chart
Set up and use 5 methods of clamping work for machining/100%.	vices, C-clamps, hold downs and T-bolts, angle plates, V-blocks
Identify parts of metal shaper/90% accuracy.	shaper, accessories, necessary tools and requisite information

Shaper (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Set up shaper and remove stock on piece of metal to correct shape and dimensions/according to print. 90% accuracy on cut.	shaper, accessories, necessary tools and requisite information
Band Saw	
Select the proper cutting blade and speed and make the necessary straight and/or contour cuts to specifications on the blueprint.	stock, band saw, blueprint
Power Hack Saw	
Identify parts of power hack saw/90% accuracy.	power hack saw, metal, necessary tools, and requisite knowledge
Cut a piece of steel to correct dimensions and angle on power hack saw/100% accuracy.	power hack saw, metal, necessary tools, and requisite knowledge
Surface Grinder	
Identify: wheel head, work holding device, hand wheels, grinding wheel, spindle/100% accuracy.	surface grinder
Set up and grind workpiece square, parallel, and to size/to specifications on the blueprint.	surface grinder, work holding device, blueprint, workpiece
Dress and true a grinding wheel on the surface grinder with a diamond dresser/100% accurate.	surface grinder and diamond dresser

Surface Grinder (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Select and identify a grinding wheel by referring to grinding symbols marked on the wheel to avoid burning the work/with 100% accuracy.	blueprint, surface grinder type of material (stock), grinding wheel symbols
Select the proper blocks (precision gauge)/ according to a blueprint/100% accuracy.	precision gauge blocks
Drill Press	
Identify the parts of a drill press: base, column, table, spindle, head/90% accuracy.	drill press
Set the speed and feed of a drill press for specific hole size and material/90% accuracy.	given a designated RPM and feed for a specific drill
Center drill, drill, countersink/to specifications on the blueprint.	drill press, tools, stock, blueprint
Set up, drill and straight ream a 3/8" hole/ ± .002.	drill press, proper and reamer
Correctly and safely set up a drill press, locate the hole, and drill it/The hole will be the proper size and located within 1/64" of the required location.	drill press, drills, center punch, ruler, and hammer
Select proper speed and pressure for feed on the drill press/with 100% accuracy.	type of metal workpiece, designated RPM and feed for specific drill

Foundry

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Identify four foundry patterns/100%.	sample foundry patterns
Case harden metal part/pass file test or Rockwell test.	furnace, kasonite
Transfer & enlarge a pattern/to within 1/16" of required dimensions.	rule, straight edge
Forge to Critical Temperature (1450° F) and hammer to specified shape allowing finish/to ± 1/16".	forging furnace, anvil, hammer
Oil finish material/to an even blue color.	furnace, oil
Explain and perform hardening, annealing, tempering, case hardening, etc. 90% accuracy.	without the use of reference materials
Build a fire in forge/so heat will reach a working temperature.	a forge, coal or coke, cold chisel quality steel, necessary tools and accessories, and requisite knowledge
Heat a piece of steel in forge and shape, i.e., to make a useful object.	a forge, coal or coke, cold chisel quality steel, necessary tools and accessories, and requisite knowledge
List and define 20 technical casting terms. The terms will relate to casting/90% accuracy.	pencil, paper
Develop two gating systems, one for a pattern one inch or thicker, and one for a pattern 1/4" or thinner./The rough castings, using each gating system, will have no defects due to poor gating, and there shall be no wasted metal because of oversized gating.	crucible furnace, pyrometer, crucible, pouring shank, crucible tongs, skimmer ladle, bell plunger, flux, flask, riddle, casting sand, spoons, trowels, sprue cutter, parting dust, bellows, molders shovel, face shields, pouring attire, and muller, proper clothing, glasses

Foundry (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Name and briefly discriminate three types of industrial foundries. All the proper names and descriptions will be listed./90% accuracy.	pencil, paper
Ram molds using a simple flat back, a complex, a split, a styrofoam, and a matchplate pattern, and cut the appropriate gating systems. The castings from those molds will have no defects due to improper ramming or poor gating systems.	flask, casting sand, riddle, bench rammer, muller, molders shovel, sprue cutter, spoons, trowels, bellows, parting dust
Prepare (temper) green sand for ramming. The sand will be at the proper moisture level for ramming/must meet A.F.S. Standards.	shovel, muller, foundry sand
Pour safely and correctly five molds using aluminum or brass./All the rough castings will have no defects caused by improper pouring or fluxing of the metal.	crucible furnace, pyrometer, crucible, pouring shank, crucible tongs, skimmer ladle, bell plunger, flux, flask, riddle, casting sand, spoons, trowels, sprue cutter, parting dust, bellows, molders shovel, face shields, pouring attire, and muller
Correctly and safely cut off the gating system and prepare the casting for finishing./All the flaws and improper protrusions will be removed from the casting.	band saw, assorted files, file cards, hand grinder, and belt sander
Safely and correctly buff finish a casting and spray paint a casting./Both the buff finished and spray painted castings will be blemish free.	buffer, spray paint booth, spray paint gun, and sand paper
Make one solid and one shell core./The cores will have sufficient strength to hold up in a mold, and a smooth surface finish.	core box, core sand, core oven, CO_2 gas, and sodium silicate

Foundry (continued)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Identify five different types of common casting patterns by naming those patterns correctly/ 100% accuracy.	assortment of patterns, pencil and paper
Identify by name the basic parts of a gating system/ 100% accuracy.	pencil, paper, and gated castings
Identify by name and describe the uses of common casting tools and equipment. 100% accuracy.	basic foundry tools
Name and describe three common types of foundry sand used in industry/100% accuracy.	pencil, paper
Safely and correctly set up and pour a lost wax casting./The casting will be free from casting flaws.	wax patterns, lost wax flasks, molding plaster, vacuum pump, curing furnace, centrifugal casting, mixing bowls, and oxy-acetylene torch set up
Oxy-fuel Welding	
Lay a 3" continuous filled bead on three different welding joints./The joints will be able to pass a break test. 100%.	oxy-acetylene welding table, oxy-acetylene welding set (tanks, regulators, torches, etc.), welding stock, filler rod, welding gloves, and protective clothing, and welding goggles
Correctly set up and shut down oxy-fuel apparatus/ 100%.	oxy-acetylene welding table, oxy-acetylene welding set (tanks, regulators, torches, etc.), welding stock, cutting torch, welding goggles, welding gloves, and protective clothing
Cut a 1/8" piece of metal with the oxy-fuel apparatus so cut is straight and smooth.	oxy-acetylene welding table, oxy-acetylene welding set (tanks, regulators, torches, etc.), welding stock, cutting torch, welding goggles, welding gloves, and protective clothing

Arc Welding

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Identify the electrode holder, ground clamp, amperage indicator, switch, chip hammer, wire brush, spring clamp, C-clamp tongs, and helmet/on a test at 100% accuracy.	an arc welder and accessories
Identify Arc Welding electrodes by the code numbers and by the color and explain what each of the numbers mean/on a test at 90% accuracy.	common electrodes and the purpose of the electrode numbering system
Arc weld a 3" continuous bead on three different welding joints./The joints will be able to pass a break test. 100%.	Arc welding booth, Arc welder, (with leads and electrode holders), electrode, welding stock, welding helmet, welding gloves, and protective clothing
Correctly and safely set up and arc weld/100%.	Arc welding booth, Arc welder (with leads and electrode holder), electrode, welding stock, welding helmet, welding gloves, and protective clothing

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Related Information	
Outline the basic historical development, growth and importance of the plastic industry from 1868 to present so that all developments are in proper cronological order and no more than two important topics are left out.	appropriate resource materials
List and explain the functions of 3 of the 4 levels of the given positions in the plastics industry.	A. Chemical Engineer B. Mechanical C. Technician D. Production Worker
List the 5 main areas of plastic consumption.	A. Building Construction B. Transportation C. Furniture D. Appliances E. Packaging
Define 7 of the following 8 terms according to SPE or SPI accepted terminology.	Plastics age Cheap plastic Plastic Thermoplastic Thermostat Synthetic Monomer Polymer
Explain 10 of the following 13 processes according to SPE or SPI accepted terminology.	Polymerization Fluidized bed coating Vinyl dipping Cold dipping Injection molding Compression molding Casting plastic resins Full mold casting process Rotational molding Thermoforming High & low pressure lamination Reinforced plastics Polystyrene expandable bead foam
List and explain 6 of the 8 forms of plastics and a use for each.	appropriate resource material

PLASTICS

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
List 4 of 6 ingredients contained in plastics and explain the purpose of each.	Appropriate resource material.
Explain 3 of the 4 properties possessed by plastics.	physical, chemical, electrical, and thermal
Classify 10 out of 15 different plastic resins as either thermoset or thermoplastic.	resin samples resin chart handouts
List 2 characteristics and 2 applications for 10 of 15 plastic resins.	resin chart handouts
Plastic Processes	
Match 4 of 5 sample resins to their correct name.	resin testing chart handout job sheet on resin testing 5 test samples matches sheet metal drip plate test tube copper wire
Produce 10 vinyl plastisol products and record results on a job sheet; 80% must be good parts and completed within 10 days.	75 durometer vinyl plastisol oven pyrometer colorant insulated gloves coin purse mold razor blade cutter 12" scale pliers, cold water, job sheet safety glasses
Produce 5 fluidized bed coated products and record results on a job sheet/3 out of 5 good parts must be produced within 5 days, and be uniform, smooth and evenly heated covering.	fluidizing chamber, pliers, insulated gloves, H.P.P.E. Powder Resin, colorant, tools (handles to be coated), solvent cleaner, steel wool, pyrometer, job sheet

PLASTICS

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Produce 25 injection molded products using 2 different machines, several molds, and at least 5 different resins. Results must be recorded on job sheet/parts should be completed within 10 working days and have at least 20 out of 25 parts should be evenly developed and colored without defects.	3 different injection molding machines, 7 different resin types - thermoplastics, several molds to fit each machine, mold release, colorant, screw driver blades, job sheet
Produce 10 compression molded products using a combination of 3 different molds and materials. Results must be recorded on Job Sheet/parts should be completed within 10 working days and have at least 8 out of 10 parts without defects.	25 ton heated hydraulic platten, 4-5 molds, mold release, metric balance scale, insulated gloves, measuring cups, thermoset materials, filler materials, wood wedges, brass probe, pin punch, hammer, abrasive paper, file, job sheet
Produce 5 rotational molded products using at least 3 different molds and materials. Results must be recorded on job sheet/parts should be completed within 5 working days and have minimum of 4 out of 5 parts without defects.	rotational molds, 5 different molds, measuring cups, metric balance scales, powdered polyethylene, powdered polystyrene, liquid vinyl plastisol, colorant, mold release, insulated gloves, razor blade cutter, job sheet, cold water
Produce 10 drape vacuum formed products, using a combination of 3 different molds, materials and sheet thicknesses. Results must be recorded on job sheet/parts should be completed within 5 working days and have a minimum of 8 out of 10 parts without defects.	drape vacuum former, variety of flat back molds, polystyrene -.060, -.030, polyethylene-.060, polypropylene -.080, vinyl -.020, paper cutter, timer in seconds, job sheet
Produce 2 high pressure laminated products. Results must be recorded on Job sheet/parts should be completed within 3 working days and have no structural defects.	pressure platen, hydraulic press, 4 pieces formica 6" x 8", 3/16" thick plywood core, phenolic sheet adhesive, file, abrasive paper, insulated gloves, job sheet
Produce 2 low pressure laminated products. Results must be recorded on job sheet/parts should be completed within 2 working days and have no structural defects.	hydraulic press, holding plates, polished plates, blotters, school ID card, scissors, polyvinyl cloride, newspaper or magazine article, insulated gloves, job sheet

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Plastic Processes	
Produce 2 polyester fiberglass products. Job sheet must be completed/parts should be completed within 4 working days and have no structural defects.	clips for board, wax mold release, polyvinyl alcohol (PVA) mold release, boomerang mold, mixing cups, metric balance scale, eye dropper, MEK - perioxide catalyst, 1" brushes, polyethylene rollers, mixing sticks, polyester resin (pre promoted), abrasive paper, lacquer thinner or resin-out, plastic gloves, scissors, fiberglass cloth and mat, job sheet
Produce 2 pentane gas filled styrene bead products. Job sheet must be completed/ parts should be completed within 5 working days and free from defects.	hot plate, polystyrene expandable beads, funnel, mold release, molds, duck decoy-Thermos, newspaper, scoop strainer, 2 pails for boiling water, insulated gloves, 1/2" dowel rod, job sheer
Produce 1 clear polyester product. Results must be charted on job sheet/part should be completed in 2 working days. Part must be free from defects.	clear polyester casting resin, mek perioxide catalyst, paste pigment, mixing sticks, eye dropper, metric balance scale, mixing cups, polyethylene molds, R.T.V. Chessmen Molds, lacquer thinner solvent, job sheet
Produce 5 W.E.P. (water extended polyester) cast products. Results must be charted on job sheet/parts should be completed in 5 working days. 1 part to be glass reinforced. 1 part wood flour reinforced. 1 part colored. 1 part use hot water. Keep resin to water ratio 1:1 good parts must be decorated ready for use. 4 out of 5 should be free from defects.	water extended polyester (W.E.P.), MEK perioxide catalyst, powdered pigment, polyethylene and wood, 3/8" variable speed drill, resin mixing blade, metric balance scale, eye dropper, mixing containers, fillers, choppers glass and wood flour, lacquer thinner, job sheet
Produce 4 vinyl plastisol jerk molder products. Results must be charted on job sheet/parts should be completed in 1 working day. Excess flush trimmed. 100% perfect parts must be produced.	75 durometer vinyl plastisol, plasticizer, eye dropper, color pigment, oven, molds (beetle, small frog, night crawler), mixing sticks, insulated gloves, cold water, job sheet

PLASTICS

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Plastic Processes	
Produce 1 aluminum casting from a styrene foam mold. Results must be recorded on job sheet/part should be produced within 5 working days and be free from structural defects.	Each student must enlist the help of a student in a metals class to help with foundry operations. Styrene foam molds must be inspected by teacher before they may be cast. styrene foam material, hot wire cutter, polyvinyl glue, aluminum ingots, silica sand, 5 gallon metal pail
Calculation	
Calculate the total lead in pounds to do compression molding, low pressure and high pressure laminating. Results to be within ± 15% of results obtained by instructor.	Formulas for each process

ELECTRICITY/ELECTRONICS TECHNOLOGY

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Occupational	
Select those occupations that are related to electronic careers/with an accuracy of 80%.	list of career occupations that contain a wide variety of careers, including those outside the electronic field
Select those skills that are related to electronic occupations/with an accuracy of 80%.	list of skills from within and outside the electronic occupation
Safety	
List the 3 main causes of accidents in electrical work/with 100% accuracy.	safety manual
List safe procedures to be followed when working with meters and power supplies/with 100% accuracy, and at least 3 specific steps for each unit.	safety manual
List the major unsafe practices that cause burns when working with electrical equipment/4 out of 5 main causes.	safety manual
Electrical	
Match electrical symbols with their names/with an accuracy of 80% and within an appropriate specified time.	word-symbol matching test of electronic and electrical symbols
Identify and explain the information printed on a cable of wire ordinarily used in house wiring, in terms of wire size, and number of conductors/with 100% accuracy.	paper, pen, wire sample

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Electrical (continued)	
Draw 10 different basic switching circuits and hook up the circuit for operation/8 of the 10 circuits must be completed and function correctly.	a power supply, switches, lights, and proper symbols
Identify electrical symbols/40 out of 48 with 100% accuracy.	paper, pen, list of symbols
Define or match with a definition: voltage, resistance and current/with 100% accuracy.	exam
Bare, tin and solder the wires to the appropriate terminals and then after approval desolder all wires/ so that all connections are correctly placed, smooth, shiny and free of excess solder and cleaned of all solder and wire upon desoldering without causing physical damage to terminals.	stranded wire, diagrams, circuit board and hand tools
Write the law of charges/with 100% accuracy.	paper and pen
List 20 devices which use electricity/with 100% accuracy.	paper and pen
Define conduction with 100% accuracy.	paper and pen
List five conductors/with 100% accuracy.	paper and pen
Write the definition for insulator/with 100% accuracy.	paper and pen
List five insulators/with 100% accuracy.	paper and pen
List 3 methods of producing electricity/with 100% accuracy.	paper and pen

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Electrical (continued)	
Identify each electrical source by matching it to the correct definition/with an accuracy of 80%.	a list of sources of electricity and a list of definitions
Write definitions for electronic terms related to matter and electricity/so well that these definitions hold true with definitions found in an electronics dictionary.	pencil and paper
Solve for the unknown resistance values/80% of the problems must be correct.	several problems with resistance values for series, parallel and series parallel circuits
Write the unit of measure for voltage, current and resistance/with 100% accuracy.	paper and pen
Compute unknown values for resistance, voltage and current using OHM's law/for 9 out of 12 problems, with 100% accuracy.	paper, pen, problems
Calculate the following: a. individual voltage drops, b. current through each load, c. individual resistance of each load with 100% accuracy.	paper, pen, problems
State the left hand rule for a current carrying conductor/with 100% accuracy.	paper and pen
State the left hand rule for a coil/with 100% accuracy.	paper and pen
Define "pole" of a magnet/with 100% accuracy.	paper and pen
Connect two coils series - aiding/with 100% accuracy.	2 coils, connection wire

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Electrical (continued)	
Connect two coils series-opposing/with 100% accuracy.	2 coils, connection wire
Define ferrous and nonferrous metal/with 100% accuracy.	paper and pen
Identify non-ferrous metals with 75% accuracy.	list or samples of ferrous and non-ferrous metals
State the relationship between the strength of an electromagnetic field, current, voltage and turns of wire in the electromagnet/with 100% accuracy.	paper and pen
Calculate: (1) a shunt value for an ammeter, and (2) a multiplier value for a voltmeter/with 100% accuracy for 2 ranges for each meter.	schematic drawing of ammeter and voltmeter, and desired ranges
Construct: (1) ohmmeter with its rheostat, (2) voltmeter with its multiplier, (3) ammeter with its shunt-for a specific range on each in the lab using the meter in actual measurement of unknown quantities of I, E, R, in a circuit/with ± 20% accuracy.	basic meter movement, resistors, potentiometer, power supply, VOM, series circuit
Electronics	
List three basic parts of an atom/with 100% accuracy.	paper and pen
Write the resistor color code/so well that all colors are paired with proper number, tolerance or multiplier.	pencil and paper
Identify the values and measure those values/for 8 out of 10 resistors.	with 10 resistors, an ohmmeter without a color code chart

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Electronics (continued)	
Identify and write an advantage and disadvantage for the three different types of resistors/with 80% accuracy.	composition resistor, wirewound resistor, film resistor
Convert numbers for different electrical values into the proper equivalent values/for 40 out of 50 values.	values of MEG, KILO, MICRO, MILLI
Identify the correct coded values of resistors/10 out of 15 times.	assortment of color coded resistors
Be able to state resistor values/80% of the responses must be correct.	given several resistors of different OHMIC, wattage and tolerance ratings
Solve for the unknown IER values/80% of the problems must be correct.	several watt's law problems
Compute wattage of a circuit: a. given current and voltage, b. given current and resistance, c. given voltage and resistance/two out of three with 100% accuracy.	paper, pen, problems
Write the definition for series and parallel circuits with 100% accuracy.	pen and paper
Read a schematic diagram and connect/8 out of 10 series and parallel resistance circuits with 100% accuracy.	assortment of schematic diagrams, assortment of resistors and connection wires
Draw a pictorial diagram from a schematic diagram/so well that the circuits are electrically the same.	pencil and paper

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Electronics (continued)	
Calculate power consumed in series and parallel circuits and calculate the KWH and cost of each circuit's consumption/with 80% of all problems solved correctly.	ohm's law and watt's law and several problems
List an advantage and disadvantage of a series and a parallel circuit/with 100% accuracy.	paper and pen
Solve problems for combination series and parallel circuits/with 80% of all problems solved correctly.	circuits and necessary values to complete the problems
Find the total resistance of a combination (series-parallel) circuit by finding the total resistance of all series and parallel networks using $R_T = R_1 + R_2 \ldots$, for series network and $R_T = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}$ or $R_T = \frac{R_1 \times R_2}{R_1 + R_2}$ or $R_T = \frac{R}{N}$ for parallel networks/with 8 of the 10 problems solved correctly.	10 combination resistive circuits
Apply Kirchoffs Law for parallel circuits to determine the total voltage, current and resistance of a parallel circuit/with 80% of all problems solved correctly.	10 schematics with necessary values
Compute total resistance of a series circuit, a parallel circuit, and a series parallel circuit/ 5 out of 6 with 100% accuracy.	assortment of schematic diagrams, paper and pens

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Electronics (continued)	
Solve for the unknown current and voltage values using Kirchoff's current and voltage laws/80% of the problems must be correct.	several problems with voltages and currents of series, parallel and series parallel circuits
Connect, adjust and read a voltmeter, an ampmeter and an ohmmeter/7 out of 10 times with 100% accuracy.	voltmeter, ampmeter, ohmmeter, power supplies (AC & DC), Load and Wire connectors
Calibrate the ohmmeter and measure component resistance/80% of the readings must be correct.	an ohmmeter and several resistive components
Measure several current and voltage DC values/ 80% of the measurements must be correct.	a VTVM, VOM, DC source, and resistive components
Zero adjust the meter and use the correct function and range to measure values/within the tolerance of the meter.	a VOM, VTVM, power supply, and load
Calibrate and operate a VTVM and VOM/so well that he can measure voltage current or resistance within 10% accuracy.	VTM or VOM
Use a VTVM and VOM to determine a state whether a circuit/is open, closed or shorted.	VTVM or VOM
Find the voltage drops in a series R.C. circuit and the total applied voltage and measure each of them/so well that the individual voltage drops add up to the instantaneous sum of the voltage.	VTVM, paper and pencil
Convert AC voltages to the requested values by using the appropriate conversion factors./80% of the problems must be accurate.	list of AC voltages of peak, peak-peak, RMS, and average values

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Electronics (continued)	
Explain in writing the purpose of the various parts of a D'Arsonval meter movement/including all the parts of the meter.	pencil and paper
Determine the ohms per volt rating of a meter movement/6 out of 10 times.	paper and pencil, 10 problems with the necessary values
Calculate the requested A-C voltage value/80% of problems should be calculated correctly.	formulas: E aver.=Ep. x .637; Erms = Ep. x .707; Ep = Ep-p ÷ 2 and several problems
Measure the amplitude and frequency/80% of the readings must be correct.	an oscilloscope and several AC voltages of unknown amplitude and frequency
List the function of each control with an accuracy of 80%.	an oscilloscope
Measure given AC voltages with an oscilloscope/ with at least ± 5% accuracy for 8 of 10 values.	oscilloscope, A-C power supply, and 10 various peak to peak values
Match the term with the correct definitions with an accuracy of 80%.	a list of the following terms and their definitions: frequency, period, wavelength, non-sinusoidal, saw-tooth, square and sinusoidal waveforms
Find the frequency and period of an A.C. sine wave using formulas of T and f/within 2 significant digits.	paper and pencil
Measure frequency through the use of lissajous patterns/so well that a ratio of the horizontal to vertical frequency is stated and the vertical frequency is computed for with no errors.	oscilloscope, paper and pencil

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Electronics (continued)	
List 3 practical applications of the use of magnetism in industry and home/without the use of reference materials.	
Match the motor type to the correct advantages and disadvantages of each/80% of the responses must be correct.	3 basic electric motors; series, shunt and DC compound with a list of advantages and disadvantages
Write an explanation and use a drawing to illustrate how torque and rotary motion are developed/ showing the magnetic field and direction of resultant motion.	D.C. motor armature, theory of operation
Make the proper motor connections in lab/to reverse the direction of rotation.	series and parallel motor, VOM, a reversing switch, power supply
Select the correct capacitance and inductance answers/80% of the selections must be correct.	several questions and list of answers on physical factors effecting capacitance and inductance
Write a formula or description for each term related to inductance/with 100% accuracy.	list of terms: inductance, selfinductance, mutual inductance, inductive reactance, leading and lagging phase angles
Write at least 3 uses of an inductor/with 100% accuracy.	paper and pen
Solve for the value of inductive reactance/with 80% accuracy.	formula: $X_L = 2 \pi f l$ and several problems with the necessary values
Identify the transformers by their symbol and identifying features (primary, secondary step up, step down turns ratio, etc.)/80% of the responses must be correct.	several transformer diagrams and values

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Electronics (continued)	
Identify the leads of a power transformer using the EIA color code and record his findings on paper/so that each lead is identified correctly.	power transformer
Calculate the percentage of ripple and regulation/80% of the problems must be solved correctly.	several problems and the appropriate AC and DC values of a power supply and formulas
Solve for the correct unknown values of capacitance and inductance with an accuracy/80% of the computations must be correct.	several problems dealing with inductance and capacitance in series, parallel and series parallel circuits
Identify and list an advantage and disadvantage of several capacitors/with 80% accuracy.	following types of capacitors: ceramic, variable, mica, polystyrene, paper, and electrolytic
Calculate the values of capacitive reactance/80% of problems should be calculated correctly.	formula $X_C = \frac{159,000}{f \times c}$ and several problems with the necessary values
Construct in the lab various combinations of resistors and capacitors for charge and discharge circuits/with at least 3 different time periods.	3 resistors, 3 capacitors, neon lamp, power supply
Perform experiments with capacitors to observe the effect frequency has on capacitive reactance and to prove the formula $X_C = \frac{1}{2\ FC}$ by showing that current increases when capacitance or frequency are increased.	capacitors, audio generator, VTVM
Use an oscilloscope to determine the phase relationship which exists between voltage, current in a series, R.L. circuit and in a series R.C. circuit/6 out of 10 times.	oscilloscope, paper and pencil

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Electronics (continued)	
Demonstrate the use of a-f and r-f generators/with at least ± 5% accuracy on output levels and 100% accuracy on frequency settings.	10 different output values and frequencies to set on each instrument
Use vector diagrams to solve practical problems in A.C. electricity/the student must illustrate a vector diagram of the proper proportions on paper and state the resultant amplitude and phase angle.	paper and pencil
Use right triangle relationships to solve practical problem in A.C./the student must set up the proper procedure on paper and read trigonometric table to find the correct answer.	paper and pencil
Draw the proper schematic for autotransformer, a step-up, and a step-down transformer/with 100% accuracy.	without use of references
Solve for the total reactance/80% of the answers must be correct.	several problems with the frequency, capacitance, inductance in series, parallel and series parallel networks
Solve for the impedance/80% of the solutions must be correct.	several problems with capacitive and inductive reactance in series, parallel and series parallel circuits
Measure the capacitance and dielectric strength of each capacitor/80% of the capacitors checked must be correct.	several capacitors and a capacitor checker
Identify the correct phase relationship in degrees in terms of leading or lagging/80% of the answers must be correct.	several sinusoidal waves of different phase relationships

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Electronics (continued)	
Indicate current flow and output wave form for each alternation of input/with an accuracy of 80%.	diagrams of half wave and full wave power supplies
Calculate the percentage of ripple and regulation/ 80% of the problems must be solved correctly.	several problems and the appropriate AC and DC values of a power supply and formulas
Write a description of the terms related to a power supply/with 100% accuracy.	list of terms: filters, rectifier, power transformer, voltage divider, bleeder resistor, voltage doubler, half and full wave rectification
Draw a schematic for each of the power supply circuits/with an accuracy of 80%.	list of the following conditions: half-wave with a TT-type filter, full wave, center tapped with a TT-type filter, full wave bridge type with a capacitor filter, full wave voltage doubler, and full wave regulated power supply
Name each circuit, draw the input and output waveforms of the proper phase and indicate proper biasing for normal operations/with an accuracy of 80%.	the diagrams of the nine basic amplifier configurations
Match the advantages and disadvantages with the appropriate amplifier/with an accuracy of 80%.	a list of different classes of amplifiers and a list of the advantages and disadvantages
Identify each type of amplifier as a class A, B, C, and AB/for all 4 circuits/with 100% accuracy.	necessary power supplies, components, instruments, scope, and amplifiers
Match each term to the correct definition/with an accuracy of 80%.	list of amplifier terms: methods of bias (list three), voltage gain, power gain, frequency response, phase inversion, types of coupling/and a list of matching definitions
Identify the cathode, anode and direction of current flow with 100% accuracy.	a diagram of a diode, tube or semiconductor

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Electronics (continued)	
Label each part and indicate which parts of the tube and transistor have similar functions/with an accuracy of 80%.	given a diagram of a diode and/or transistor
Match the diagrams with the appropriate names/ with an accuracy of 80%.	list of names and diagrams for different type of biasing and coupling
Collect data and develop static characteristic curves/so that they are similar to those found in the manufacturers specification manual.	a tube or transistor and appropriate lab equipment
Build and test 3 types of amplifiers, in the lab, the audio amp, push-pull amp and the phase inverter/ all of which must operate within ± 20% of a given standard.	equipment, components, schematics, test specifications
Determine parameters such as MU, gm and rp/ answers must be within ± 5%.	characteristic curves
Construct a load line and indicate operating point (Q)/with 100% accuracy as to procedure and with consideration given to accuracy of the graph, etc.	characteristic curves, R, source voltage, and bias at quiescents
Be able to calculate the appropriate voltage or current gain/with ± 5% accuracy as to procedure and with consideration given to ability to interpolate values from the graph.	several characteristic curves with load line, Q point, and input signal
Calculate the maximum power curve on the graph/ constructed curve should be similar to the standard.	transistor manual, specified transistor, and graphs

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Electronics (continued)	
Match the name with the electronic symbol/with 80% accuracy.	symbols and names for JFET, MOSFET, ZENGER DIODE, TUNNEL DIODE, SCR TRIAC AND DIAC AND UJT
Identify oscillators and multivibrators with an accuracy of 80%.	schematic diagrams of several types of oscillators and multivibrators
Match the name with the circuit symbol/within accuracy of 80%.	given a diagram and list of the following circuits: AND, OR, NAND, NOR INVERTER, FLIP FLOP, MEMORY, COUNTER, ADDER, SHIFT REGISTER
Label the function of each block of an AM superhet receiver/with an accuracy of 80%.	block diagram of an AM superhet receiver
Construction-Electrical	
Wire a doorbell circuit/so that it will ring when either button is pushed.	two doorbell buttons, transformer, chime, wire
Wire a duplex outlet/so that one half of the duplex is hot all of the time and the second hot only when the toggle is in the ON position.	a duplex outlet, toggle switch, junction box, wire
Wire four duplex outlets in parallel/so that all outlets will have the appropriate voltage at their terminals.	four duplex outlets, wire, power source
Wire a simple light circuit/so that the light will turn on and off with the switch in the proper position.	given a single pole, single throw switch, light, wire
Wire a light circuit/so that the light can be turned ON and OFF with either switch.	given two three-way switches and a light fixture, wire, and power supply

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Construction-Electrical (continued)	
Wire an outlet/so there are 240 volts at the proper terminals.	a 240 volt three wire receptacle, wire, power supply
Wire the main breaker fuses or switch/so that it will properly protect all of circuits and allow the entire system to be connected or disconnected.	a circuit breaker or fuse cabinet and service entrance wire
Wire four 120 volt branch circuits/so that they can be controlled by the proper branch breaker or fuse.	a circuit breaker or fuse cabinet
Identify proper architectural electrical symbols/ with 9 out of 10 efficiency.	standard symbols used in residential wiring

SMALL ENGINES (POWER MECHANICS)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Related Information	
Explain the four strokes of a four stroke/ cycle engine (What happens in each of the four strokes?)/with 100% accuracy.	paper with four drawings of engine minus piston and valves (draw the piston and valves in, in their position and indicate intake compression, power, and exhaust
Locate engine specifications in the master mechanics manual/as requested by the instructor to an accuracy of 100%.	given lecture, ending identification number, and master mechanics manual
Locate parts in the master parts manual/as predetermined by the instructor to an accuracy of 100%.	given lecture, engine identification number, and master parts manual
Estimate parts and labor cost of minor repairs/ to within $5.00 of actual cost.	engine in need of work, overhaul/worksheet actual cost based upon flat-rate manual figures
Complete service order form in a ledgible fashion to include make, model number, serial number, engine make, engine model, engine serial, description of work to be done, customer's name, address and phone and signature.	
Identify areas of employment of which the skills learned in class will qualify him for the job/ bring in 5 employment ads needing skills they have learned.	newspapers
Remove and attach an engine and replace and align all drive mechanisms/so that it will perform the task for which the machine was designed, to manufacturers specifications.	a machine with a drive unit, mechanics manual and hand tools
Remove head, check for head wrap, attach to block and torque head bolts/to within ± 5" lbs. of manufacturers specifications, as checked by the instructor using the same tool.	an engine, torque wrench, mechanics manual, and hand tools

SMALL ENGINES (POWER MECHANICS)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Related Information	
Drill and remove broken headbolts or studs/ well enough so a new bolt or stud may be installed.	engine with broken stud or bolt, easy outs, drill and hand tools
Install heli-coil, keenzert or similar thread insert in place of damaged thread so new bolt or stud may be properly installed.	Thread insert, installation tools for whichever type used
Check engine compression and record observations/ the comparison to manufacturers recommendations must concur with that of the instructor using the same test tool.	a two or four stroke cycle engine, compression gauge, shop manual, and hand tools
Test cylinder leakage and record results. Results should be within ± 10% of reading obtained by instructor with same tester.	used four cycle engine, air transformer, air hose, shop manual, and hand tools
Measure crankshaft end play and record results. Measurement must be within ±.002 of that obtained by instructor using same set-up.	Engine of instructor's or student's choice, feeler gauges, dial indicator (whichever is appropriate
Determine connecting rod to crankshaft clearance using PLASTIGAGE. Results should be within ±.001 of that obtained by instructor on same engine.	Disassembled engine or just connecting rod and crankshaft, plastigage
Determine minimum piston to cylinder wall clearance. Results to be within ±.002 of that obtained by instructor on same set-up.	Piston and matching cylinder, micrometer, bore gauge or telescoping gauges.
Identify and describe the function of at least four methods of producing power or heat which could be used as alternatives to fossil-fuel.	

SMALL ENGINES (POWER MECHANICS)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Parts Identification	
Disassemble the engine and identify 80% of the parts and the system to which they belong.	four stroke cycle engine, and hand tools
Explain the function of a crank-shaft and name the parts/name parts with 80% accuracy and the function with 100% accuracy.	one crankshaft from a small engine
Correctly name the parts of a piston and explain the function of each to an 80% accuracy.	List of piston parts: two different designs of pistons head, ring groove, ring land, skirt, pin bore, pin boss, pin offset, ports, baffel, oil holes.
Explain the function and parts of a camshaft/ name parts and function with 80% accuracy.	one camshaft
Assemble a four-stroke/cycle single cylinder engine, service and adjust to make it operational.	one disassembled operational small engine
Tools	
Correctly name and explain the function of 18 of 20 tools used in small engine repair.	List to be the option of the instructor
Measuring	
Make micrometer readings/100% of the time, to an accuracy of ±.001 in. and/or ±.02 mm.	micrometers (0-1, 1-2, 2-3) telescoping gauge, various engine parts, recording sheet, also metric micrometers 0-25 mm, 25-50 mm, 50-75 mm, and 75-100 mm.
Measure, record, and evaluate all specifications given for an engine/to the significant dimension as given in the table of specifications of the shop manual, with ± one significant number of that obtained by the instructor using the same tools.	a worn shop engine, shop manual measuring instruments, and hand tools

SMALL ENGINES (POWER MECHANICS)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Lubrication System	
Describe the function of an engine lubrication system to a 100% accuracy.	none
Identify, by sight, the type and parts of a lubrication system to an 80% accuracy.	either drawings or actual parts of various lubrication systems
Observe the action of the oil dipper of slinger, and correctly describe the operation of it.	horizontal engine with a splash oil system
Observe the action of the barrel and plunger type oil pump and correctly describe the operation of it.	an engine with a barrel and plunger type oil pump, mechanics manual, and hand tools
Drain and refill the crankcase with clean oil to the recommended level using the correct viscosity oil.	an engine that has been in operation for at least 25 hours, and hand tools
Cooling System	
Name the different cooling systems used in small engines/explain the operation of different cooling systems with 80% accuracy.	small engines book
Observe and sketch the air cooling system tracing the path of cooling air through the engine. Label all component parts with 80% accuracy.	engine shop manual, hand tools
Fuel System Carburetion	
Disassemble and observe the operation of a fuel pump/understand its function well enough to make a sketch tracing one path of fuel through the pump.	a diaphragm fuel pump, shop manual, and hand tools
Describe the function and operation of a reed valve and a rotary valve with 100% accuracy.	typical two stroke cycle engine shop manual, and hand tools
Disassemble and correctly identify basic parts of a diaphragm carburetor/80% of parts to be correctly identified.	diaphragm carburetor, shop manual, and hand tools

SMALL ENGINES (POWER MECHANICS)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Fuel System Carburetion	
Disassemble and correctly identify basic parts of a float carburetor/80% of parts to be correctly identified.	float feed carburetor, shop manual, and hand tools
Adjust an engine carburetor for maximum power and performance, as determined by the instructor or measured on a dynomometer, if available.	a two or four cycle engine, initial adjustments, and hand tools, small engine dynomometer, if available
Given a list of engine malfunctions related to carburetion, identify the proper remedies for each with 80% accuracy.	List of any number of carburetor malfunctions
Ignition System	
Identify by name and function/100% of the parts of a battery ignition system, a magneto ignition system, and a breakerless (CD) type ignition system.	parts of the three basic types of ignition systems or at least pictures of them
Given an assortment of ignition parts, sort those belonging to the primary circuit from those belonging to the secondary circuit with 90% accuracy.	assorted ignition parts
Clean and regap a spark plug that has been in operation a minimum of 25 hours/to within .001" of manufactures specs, and must concur with the check of the instructor using the same tools.	spark plug, shop manual, spark plug cleaning station, and hand tools
Adjust the breaker points to within .001" of manufacturers specifications.	engine with breaker point assembly, shop manual, and hand tools
Adjust engine timing to within $\pm$.002" of manufacturers specifications.	engine with adjustable timing, timing tools, shop manual, and hand tools
Test the magneto output and record observations. Results should be within $\pm$ 10% of reading obtained by instructor with same tester.	engine, spark plug, spark tester, shop manual, and hand tools

SMALL ENGINES (POWER MECHANICS)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Ignition System	
Test the resistance of the breaker points in ohms, and record the results/results must be within .05 ohms of that obtained by the instructor using the same tester.	engine with used breaker points, ignition tester, shop manual, and hand tools
Run a coil power test and record observations/ results must be within ± .1 amp of that obtained by the instructor using the same tester.	used coil, shop manual, ignition tester, and hand tools
Test a condenser for leakage and short/test results should be within ± 10% of reading obtained by instructor with same tester.	a used condenser ignition tester, shop manual, and hand tools
Identify the idfferences between a battery ignition coil and a magneto ignition coil.	Samples of battery and magneto coils
Electrical System	
Describe the electron theory, and explain what is voltage, current, and resistance accurately enough to be correct/100% of the time.	test and experiments
Identify and draw correctly at least/10 basic electric schematic symbols.	text, test, list of basic symbols such as: fuse, resistor, wire, connection, SCR, switch, light bulb, regulator, starter, rectifier; (as used in small engine schematic diagrams
Calculate volts, ohms, and amps in series and parallel circuits by using Ohm's Law accurately/ 8 out of 10 times.	study sheets, test
Properly connect a VOM in a series/parallel circuit and accurately read and record measurements of volts, ohms, and amps at least/15 out of 20 times.	VOM, components in a series/parallel circuit, record sheet

SMALL ENGINES (POWER MECHANICS)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Electrical System	
Properly solder components and note the reasons for poor soldering/9 out of 10 times.	solder, soldering pencils, soldering exercises
Name and describe the function of the parts of a (DC) electric motor/generator or starter, with 90% accuracy.	motor, generator and/or starter
Test an electric starter armature/test results will concur with those of the instructor using the same tester.	electric starter, growler, hand tools, and instruction in the use of the growler
Identify and find the values for various electrical components (resistors, capacitors, transformers, transistors)/8 out of 10 times.	color code charts, assorted components, identification and value charts
Service a new wet-cell battery to manufacturer's specifications.	New wet-cell battery, electrolyte
Check, clean fill and charge a used wet-cell battery to manufacturer's specifications.	used battery, battery tool set, distilled water, battery charger
Valve Train	
Describe the purpose and operation of the valve system.	valve system or engine
Name parts of the valve system/by sight, name 80% of the parts and their functions.	valve system, cut away view
Service and recondition mushroom valves/to within manufacturer's specifications 100% of the time.	a four stroke cycle engine, shop manual, valve reconditioning equipment, and hand tools
Remove valves and check valve guides for wear/ according to manufacturer's specifications.	four cycle engine, mechanics manual and hand tools
Ream valve guides/to meet manufacturer's specifications.	four cycle engine, mechanics manual and hand tools

SMALL ENGINES (POWER MECHANICS)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Troubleshooting	
Use repair manual as a guide to solving minor problems and finding specifications/100% of the time.	repair manuals, study sheet, engine
Given a list of troubleshooting problems, explain how to remedy the problems/do this with 80% accuracy.	none
Use troubleshooting techniques and procedures to the point of diagnosising minor problems/4 out of 5 times.	"bugged" engines for diagnosis, normal overhaul tools
Miscellaneous	
Disassemble a windup starter, name the parts, and reassemble the starter/so that it will provide the 2 basic requirements of all starters.	a windup starter, gloves, service manual, and hand tools
Disassemble a rope or cable recoil starter, name the parts, and reassemble the starter/so that it will provide the 2 basic requirements of all starters.	a rope rewind starter, gloves, shop manual, and hand tools
Adjust an engine with an air vane governor/to within 50 rpm of service manual specifications.	a two or four cycle engine, hand tachometer, shop manual and hand tools
Adjust an engine with mechanical governor controls for proper operation, to within 50 RPM of manufacturer's specifications.	operational engines having mechanical governors, hand tools
Hone, bore or deglaze cylinder walls/so that they are free of glaze and varnish, and they have the proper cross hatch pattern and are within $\pm$ .002 inch of manufacturer's specifications.	two or four cycle engine, hone and honing fluid, electric drill, and hand tools, boring bar, if available

SMALL ENGINES (POWER MECHANICS)

PERFORMANCE OR TASK/CRITERION OR MINIMUM ACHIEVEMENT	REQUIRED TOOLS, EQUIPMENT, ETC.
Miscellaneous	
Replace worn piston rings, and demonstrate that the installation is correct/by making a sectional sketch showing the grooves and chamfers in their position on the piston.	an engine that is torn down or in for repair, a shop mechanic manual, ring expander, ring compressor, and hand tools
Locate intake and exhaust ports, observe how they are covered and uncovered, and sketch the path of air fuel mixture through the engine/as accurately as engine design requires.	two-stroke cycle engine, shop manual, and hand tools
Identify and service oil both, foam, paper type, and flocked type air cleaners according to manufacturer's specifications.	assorted air filters

APPENDIX A

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APPENDIX B

Existing State Safety Standards for General Industry and School Shops

The following is a list of General Industry Standards that apply to all employers:

____Part 1, General Rules (effective 12/28/74)
____Part 1A, Abrasive Wheels (effective 1/17/73)
____Part 2, Floor and Wall Openings, Stairways and Skylights (effective 8/28/73)
____Part 3, Fixed Ladders (effective 5/15/74)
____Part 4, Portable Ladders (effective 3/19/74)
____Part 5, Scaffolding (effective 11/16/74)
____Part 6, Fire Exits (effective 5/15/74)
____Part 7, Guards for Power Transmission (effective 10/15/71)
____Part 8, Portable Fire Extinguishers (effective 7/20/74)
____Part 9, Fixed Fire Equipment (effective 8/17/74)
____Part 11, Polishing, Buffing and Abrading (effective 9/15/70)
____Part 12, Welding and Cutting (9/25/74)
____Part 14, Conveyors (effective 11/9/72)
____Part 16, Labeling of Hazardous Substances (effective 11/20/73)
____Part 17, Refuse Packer Units (effective 4/13/74)
____Part 18, Overhead and Gantry Cranes (effective 12/28/74)
____Part 19, Crawler, Locomotive and Truck Cranes (effective 12/28/74)
____Part 21, Powered Industrial Trucks (effective 11/16/74)
____Part 23, Power Press (effective 9/10/74)
____Part 26, Metalworking Machinery (effective 4/13/74)
____Part 27, Woodworking Machinery (effective 7/20/74)
____Part 31, Personal Protective Equipment (effective 12/28/74)
____Part 32, Head Protection Equipment (effective 5/16/72)
____Part 35, Face and Eye Protection (effective 10/15/70)
____Part 37, Accident Prevention Signs and Tags (effective 12/28/74)
____Part 38, Hand and Portable Powered Tools (effective 7/20/74)
____Part 42, Forging (effective 4/13/74)
____Part 44, Foundries (effective 4/13/73)
____Part 45, Die Casting (effective 7/26/73)
____Part 51, Logging (effective 5/15/74)
____Part 52, Sawmills (effective 5/15/74)
____Part 53, Tree Trimming and Removal (effective 12/28/74)
____Part 54, Powered Groundskeeping Equipment (effective 11/16/74)
____Part 58, Vehicle Mounted Elevating and Rotating Platforms (effective 12/28/74)
____Part 62, Plastic Molding (effective 8/28/73)
____Part 63, Pulp, Paper and Paperboard Mills (effective 12/14/73)
____Part 65, Mills and Calenders for Rubber and Plastic (effective 9/22/73)
____Part 71, Laundry and Dry Cleaning Machinery and Operations (effective 11/20/73)
____Part 72, Automotive Service Operations (effective 12/28/74)
____Part 81, Baking Operations (effective 11/16/74)

MAIL TO: Standards Section
Michigan Department of Labor
7150 Harris Drive
State Secondary Complex
Lansing, Michigan 48926

_____
(Name)

_____
(Firm Name)

_____
(Address)

_____
(City, State, Zip)

Existing State Construction Standards Continued Under MIOSHA

The following is a list of Construction Standards that apply to all employers:

____Part 1, General Rules (effective 3/1/74)
____Part 4, Sanitation (effective 3/1/74)
____Part 5, First Aid (effective 8/14/66)
____Part 6, Personal Protective Equipment (effective 12/20/74)
____Part 7, Welding and Cutting (effective 3/1/74)
____Part 8, Handling and Storage of Materials (effective 3/1/74)
____Part 9, Excavation, Trenching and Shoring (effective 3/1/74)
____Part 10, Lifting and Digging Equipment (effective 8/24/74)
____Part 11, Scaffolds (effective 11/15/67)
____Part 12, Ladders (effective 5/15/65)
____Part 13, Mobile Equipment (effective 3/1/74)
____Part 14, Tunnels (effective 3/1/74)
____Part 16, Power Transmission and Distribution (effective 12/20/74)
____Part 17, Electrical Installations (effective 3/1/74)
____Part 18, Fire Prevention (effective 3/1/74)
____Part 19, Tools (effective 12/20/74)
____Part 20, Demolition (effective 3/1/74)
____Part 21, Guard Rails, Runways and Ramps (effective 3/1/74)
____Part 22, Signals, Signs and Tags (effective 3/1/74)
____Part 24, Tar Kettles (effective 8/24/74)
____Part 25, Concrete Construction (effective 3/1/74)
____Part 26, Steel Erection (effective 3/1/74)
____Part 27, Blasting and Use of Explosives (effective 3/1/74)
____Part 28, Marine Operations (effective 3/1/74)
____Part 29, Hearing Procedures (effective 9/15/71)

Existing Federal Safety Standards for Construction and School Shops

____1926.556 Aerial Lifts
____1926.952 Mechanical Equipment
____1926.953 Material Handling

MAIL TO: Standards Section
Michigan Department of Labor
7150 Harris Drive
State Secondary Complex
Lansing, Michigan 48926

_____
(Name)

_____
(Firm Name)

_____
(Address)

_____
(City, State, Zip)

Existing Federal Safety Standards for General Industry and School Shops

____1910.68 Manlifts*
____1910.94 Ventilation*
____1910.101 Compressed Gases (general requirements)
____1910.102 Acetylene
____1910.103 Hydrogen
____1910.104 Oxygen
____1910.105 Nitrous Oxide
____1910.106 Flammable and Combustible Liquids*
____1910.107 Spray Finishing Using Flammable and Combustible Liquids*
____1910.108 Dip Tanks Containing Flammable or Combustible Liquids*
____1910.109 Explosives and Blasting Agents
____1910.110 Storage and Handling of Liquefied Petroleum Gases
____1910.111 Storage and Handling of Anhydrous Ammonia
____1910.144 Safety Color Code for Marking Physical Hazards*
____1910.166 Inspection of Compressed Gas Cylinders
____1910.167 Safety Relief Devices for Compressed Gas Cylinders
____1910.168 Safety Relief Devices for Cargo and Portable Tanks Storing Compressed Gases
____1910.169 Air Receivers
____1910.176 Handling Materials - General
____1910.181 Derricks
____1910.214 Cooperage Machinery
____1910.262 Textiles*
____1910.267 Agricultural Operations*
____1910.308 Application
____1910.309 National Electrical Code

*These Federal standards also contain occupational health standard elements administered and enforced by the Michigan Department of Public Health.

MAIL TO: Standards Section
Michigan Department of Labor
7150 Harris Drive
State Secondary Complex
Lansing, Michigan 48926

_____
(Name)

_____
(Firm Name)

_____
(Address)

_____
(City, State, Zip)

APPENDIX C

NATIONAL STANDARD SCHOOL SHOP SAFETY INSPECTION CHECK LIST

Prepared by the Joint Safety Committee of the
AMERICAN VOCATIONAL ASSOCIATION — NATIONAL SAFETY COUNCIL

_____ Date_____

_____

INTRODUCTION

A safe environment is an essential part of the school shop safety education program. The safe environment will exist only if hazards are discovered and corrected through *regular* and *frequent* inspections by school personnel—administrators, teachers and students. Safety inspections are to determine if everything is satisfactory.

Inspections may be made at the request of the board of education, the school administration or upon the initiative of the teacher. Some communities have drawn upon the cooperative service of professional safety engineers, inspectors of state labor departments, insurance companies and local safety councils to supplement and confirm inspections by school personnel.

The National Standard School Shop Safety Inspection Check List, recommended by the President's Conference on Industrial Safety is an objective inspection procedure for the school shop.

DIRECTIONS

WHO INSPECTS?

This will depend upon local policies. It is recommended, however, that shop teachers, and students—the student safety engineer and/or student safety committee—participate in making regular inspections. This not only tends to share responsibility but stimulates a broader interest in the maintenance of a safe school shop.

WHEN TO INSPECT?

As a minimum, a safety inspection should be made at the beginning of every school term or semester. More frequent inspections may be advisable.

HOW TO INSPECT?

Inspections should be well planned in advance.

Inspections should be systematic and thorough. No location that may contain a hazard should be overlooked.

Inspection reports should be clear and concise, but with sufficient explanation to make each recommendation for improvement understandable.

FOLLOW-UP

The current report should be compared with previous records to determine progress. The report should be studied in terms of the accident situation so that special attention can be given to those conditions and locations which are accident producers.

Each unsafe condition should be corrected as soon as possible in accordance with accepted local procedures.

A definite policy should be established in regard to taking materials and equipment out of service because of unsafe conditions.

The inspection report can be used to advantage as the subject for staff and class discussion.

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CHECKING PROCEDURE

Draw a circle around the appropriate letter, using the following letter scheme:

S — Satisfactory (needs no attention)
A — Acceptable (needs some attention)
U — Unsatisfactory (needs immediate attention)

Recommendations should be made in all cases where a "U" is circled. Space is provided at the end of the form for such comments. Designate the items covered by the recommendations, using the code number applicable (as B-2).

In most categories, space is provided for listing of standards, requirements or regulations which have local application only.

A. GENERAL PHYSICAL CONDITION

1. Machines, benches, and other equipment are arranged so as to conform to good safety practices ..... S A U
2. Condition of stairways ..... S A U
3. Condition of aisles ..... S A U
4. Condition of floors ..... S A U
5. Condition of walls, windows, and ceiling ..... S A U
6. Illumination is safe, sufficient, and well placed ..... S A U
7. Ventilation is adequate and proper for conditions ..... S A U
8. Temperature control ..... S A U
9. Fire extinguishers are of proper type, adequately supplied, properly located and maintained ..... S A U
10. Teacher and pupils know location of and how to use proper type for various fires ..... S A U
11. Number and location of exits is adequate and properly identified ..... S A U
12. Proper procedures have been formulated for emptying the room of pupils and taking adequate precautions in case of emergencies S A U
13. Lockers are inspected regularly for cleanliness and fire hazards. S A U
14. Locker doors are kept closed ..... S A U
15. Walls are clear of objects that might fall ..... S A U
16. Utility lines are properly identified ..... S A U
17. Teachers know the procedure in the event of fire including notification of the fire department and the evacuation of the building. S A U
18. Air in shop is free from excessive dust, smoke, etc. .... S A U
19. _____ S A U
20. _____ S A U
21. _____ S A U
22. _____ S A U
23. Evaluation for the total rating of A. GENERAL PHYSICAL CONDITION ..... S A U

B. HOUSEKEEPING

1. General appearance as to orderliness..... S A U
2. Adequate and proper storage space for tools and materials. S A U
3. Benches are kept orderly..... S A U
4. Corners are clean and clear..... S A U
5. Special tool racks, in orderly condition, and provided at benches and machines..... S A U
6. Tool, supply, and/or material room is orderly..... S A U
7. Sufficient scrap boxes are provided..... S A U
8. Scrap stock is put in scrap boxes promptly..... S A U
9. Materials are stored in an orderly and safe condition.. S A U
10. A spring lid metal container is provided for waste and oily rags. S A U
11. All waste materials and oily rags are promptly placed in the containers..... S A U
12. Containers for oily rags and waste materials are frequently and regularly emptied..... S A U
13. Dangerous materials are stored in metal cabinets..... S A U
14. Machines have been color conditioned..... S A U
15. Safety cans are provided for flammable liquids..... S A U
16. Bulk storage of dangerous materials is provided outside of the main building..... S A U
17. A toe-board or railing around a mezzanine used for storage or washing facilities..... S A U
18. Materials are stored in an orderly and safe condition on this mezzanine..... S A U
19. Flammable liquids are not used for cleaning purposes S A U
20. Floors are free of oil, water and foreign material..... S A U
21. Floors, walls, windows, and ceilings are cleaned periodically. S A U
22. _____ S A U
23. _____ S A U
24. _____ S A U
25. _____ S A U
26. Evaluation for the total rating for B. HOUSEKEEPING S A U

C. EQUIPMENT

1. Machines are arranged so that workers are protected from hazards of other machines, passing students, etc..... S A U
2. Danger zones are properly indicated and guarded..... S A U
3. All gears, moving belts, etc., are protected by permanent enclosure guards..... S A U
4. All guards are used as much as possible..... S A U

C. EQUIPMENT (continued)

5. All equipment control switches are easily available to operator. S A U
6. All machines are "locked off" when instructor is out of the room. S A U
7. Brushes are used for cleaning equipment..... S A U
8. Nonskid areas are provided around machines..... S A U
9. Machines are in safe working condition..... S A U
10. Machines are guarded to comply with American Standards Association and local state code..... S A U
11. Adequate supervision is maintained when students are using machines and dangerous tools..... S A U
12. Tools are kept sharp, clean and in safe working order S A U
13. All hoisting devices are in safe operating condition... S A U
14. Machines are shut off while unattended..... S A U
15. Adequate storage facilities for tools, equipment, etc., not in immediate use..... S A U
16. _____ S A U
17. _____ S A U
18. _____ S A U
19. _____ S A U
20. Evaluation for the total rating for C. EQUIPMENT.. S A U

D. ELECTRICAL INSTALLATION

1. All switches are enclosed..... S A U
2. There is a master control switch for all of the electrical installations..... S A U
3. Electrical outlets and circuits are properly identified.. S A U
4. All electrical extension cords are in safe condition and are not carrying excessive loads..... S A U
5. All machine switches are within easy reach of the operators. S A U
6. Electrical motors and equipment are wired to comply with the National Electric Code..... S A U
7. Individual cut-off switches are provided for each machine. S A U
8. Machines are provided with overload and underload controls by magnetic pushbutton controls..... S A U
9. No temporary wiring in evidence..... S A U
10. _____ S A U
11. _____ S A U
12. _____ S A U
13. _____ S A U
14. Evaluation for the total rating for D. ELECTRICAL INSTALLATION..... S A U

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E. GAS

1. Gas flow to appliances is regulated, so that when appliance valve is turned on full, the flames are not too high..... S A U
2. Gas appliances are properly insulated with asbestos or other insulating material from tables, benches, adjacent walls, or other flammable materials ..... S A U
3. No gas hose is used where pipe connections could be made. S A U
4. Gas appliances have been adjusted so that they may be lighted without undue hazard..... S A U
5. Students have been instructed when lighting gas appliances to light the match first before turning on the gas..... S A U
6. There are no gas leaks, nor is any odor of gas detectable in any part of the shop..... S A U
7. Shop instruction has been given concerning the lighting of gas furnaces operating with both air and gas under pressure.. S A U
8. When lighting the gas forge, goggles are worn..... S A U
9. When lighting the gas furnace, the following procedure is used: (a) light the match; (b) turn on the gas; (c) drop the match in the hole in top of the furnace..... S A U
10. In shutting down the gas furnace, the gas valve is closed before the air valve..... S A U
11. _____ S A U
12. _____ S A U
13. _____ S A U
14. _____ S A U
15. Evaluation for the total rating for E. GAS..... S A U

F. PERSONAL PROTECTION

1. Goggles or protective shields are provided and required for all work where eye hazards exist..... S A U
2. If individual goggles are not provided, hoods and goggles are properly disinfected before use..... S A U
3. Shields and goggles are provided for electric welding.. S A U
4. Rings and other jewelry are removed by pupils when working in the shop..... S A U
5. Proper kind of wearing apparel is worn and worn properly for the job being done..... S A U
6. Leggings, safety shoes, etc., are worn in special classes such as foundry, etc., when needed..... S A U
7. Respirators are provided for dusty or toxic atmospheric conditions such as when spraying in the finishing room..... S A U
8. Provisions are made for cleaning and sterilizing respirators. S A U
9. Students are examined for safety knowledge ability.. S A U
10. Sleeves are rolled above elbows when operating machines. S A U
11. Clothing of students is free from loose sleeves, flopping ties, loose coats, etc. ..... S A U
12. _____ S A U

F. PERSONAL PROTECTION (continued)

13. _____ S A U
14. _____ S A U
15. _____ S A U
16. Evaluation for the total rating for F. PERSONAL PROTECTION. S A U

G. INSTRUCTION

1. Shop Safety is taught as an integral part of each teaching unit. S A U
2. Safety rules are posted particularly at each danger station. S A U
3. Printed safety rules are given each student..... S A U
4. Pupils take a safety pledge..... S A U
5. Use of a safety inspector..... S A U
6. Use of a student shop safety committee..... S A U
7. Use of safety contests..... S A U
8. Motion and/or slide films on safety are used in the instruction. S A U
9. Use of suggestion box..... S A U
10. Use of safety tests..... S A U
11. Use of safety posters..... S A U
12. Talks on safety are given to the classes by industrial men. S A U
13. Tours are taken of industrial plants as a means of studying safety practices ..... S A U
14. Periodic safety inspections of the shop are made by a student committee ..... S A U
15. Men from industry make safety inspections of the shop S A U
16. Student shop safety committee investigates all accidents S A U
17. A proper record is kept of safety instructions which are given, preferably showing the signature of student on tests given in this area ..... S A U
18. Rotate students on the Shop Safety Committee so that as many students as possible have an opportunity to participate... S A U
19. _____ S A U
20. _____ S A U
21. _____ S A U
22. _____ S A U
23. Evaluation for the total rating of G. INSTRUCTION S A U

H. ACCIDENT RECORDS

1. There is a written statement outlining the proper procedure when and if a student is seriously hurt..... S A U
2. Adequate accident statistics are kept..... S A U
3. Accidents are reported to the proper admini trative authority by the instructor ..... S A U

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H. ACCIDENT RECORD (continued)

4. A copy of each accident report is filed with the State Department of Education ..... S A U

5. Accident reports are analysed for instructional purposes and to furnish the basis for elimination of hazards..... S A U

6. _____ S A U

7. _____ S A U

8. _____ S A U

9. _____ S A U

0. Evaluation for the total rating of H. ACCIDENT RECORDS. S A U

I. FIRST AID

1. An adequately stocked first aid cabinet is provided... S A U

2. The first aid is administered by a qualified individual S A U

3. The school has individuals qualified to administer first aid. S A U

4. _____ S A U

5. _____ S A U

6. _____ S A U

7. _____ S A U

8. Evaluation for the total rating of I. FIRST AID.... S A U

RECOMMENDATIONS

Code No.	

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